some way to the Silicon Valley. I do not want to get into a lot of argumentation, but Congressman Volkmer's comments brought my thoughts to a focus.

It seems to me you are giving up a very valuable option when you are, in effect, putting out an RFP that does not permit you to deal with Madison Avenue while you are dealing with the Silicon Valley.

I yield back to Congressman Volkmer.

Secretary BALDRIGE. Mr. Chairman, I think that we would have the ability to make the RFP broad enough to allow people to quote on very broad segments. If you just took your example, the marketing of the data, the collection at the bottom, on the ground, of what goes on at the top, I think we could make the RFP broad enough to include that.

What I am opposed to, because, as I said, I think I have had some experience in that area, is allowing very small segments of this to be chopped up because you lose your accountability. I could see broader applications of that, as Congressman Volkmer brought up, and I think we could draw the RFP broadly enough to include that, also.

Mr. SCHEUER. You are going to make the decision about the responsibilities and how these roles are going to be passed out. I just want you to retain all your options. That is a basic principle of politics and business—preserve your options.

Congressman Volkmer?

Mr. VOLKMER. I still have one last area that I would like to get into that has not been brought up during the session. I will probably have some additional questions. I know it is getting late. I will submit those questions in writing, if I feel it is necessary. Mr. Secretary, I would appreciate your response when the questions are submitted.

This is on the international aspects of the weather satellites. I would like to give you a short statement first and see if you agree with it. The international weather data exchange agreements that we have had with other countries have worked well, based on consensus negotiations between governments for which the criteria has been weather service.

Now, it is not clear to me how this will work when the profit criterion is injected. The question is, who would represent the United States at the pertinent world meteorological organization meetings, the U.S. Government or the satellite organizations?

Secretary BALDRIGE. If I may comment on that——

Mr. VOLKMER. Yes.

Secretary BALDRIGE. We do now, as a government, participate fully in the international free exchange of weather data. We want nothing in this transfer to change that. We will make sure that the requirements are written up so that cannot be changed, because we want to keep that.

We will continue to share the weather satellite data through both the global telecommunication system of the World Meterological Organization and through direct broadcast of weather data from both polar orbiting and geostat satellites.

The private entity, if this went through, would support the U.S.-designated representatives to various organizations, but the U.S.

Government presence would be the dominant one. We just would need, obviously, that support as a team.

Authority to reach agreements with other governments or international organizations would have to remain with the U.S. Government, so that in those decisions obviously it would not just be Commerce, but it would be State, Defense, and so forth, involved in our position on that.

The private firm would have to be required, in addition to supporting the free exchange of weather data, to provide all data under nondiscriminatory data pricing and dissemination. It is the same for customers.

We would continue to support all the existing international agreements in this area.

Now that is a rough outline of how we would proceed.

Mr. VOLKMER. You answered most of the question, but perhaps I do not quite understand exactly we are doing now. I may not.

As I understand it now, our weather satellites are broadcasting and countries can pick up that information from their own ground stations; is that correct?

Secretary BALDRIGE. I think that is part of the international agreement, but we would not change that.

Mr. VOLKMER. Under commercialization, we are not going to have a satellite up there. The U.S. Government is not going to have a satellite broadcasting weather data. What we are going to have is a private sector satellite up there broadcasting.

Will France, England, or any other country then be able to obtain the information from that satellite directly or will they have to go to a government source?

Secretary BALDRIGE. Let me answer in the most truthful way I can. I don't know. That is one of the things that we have to get squared away.

In general, I had not thought about that before. In general, we are trying to structure this so that it is the same as whatever we are doing now. However, I can see your point there. Let me come back with an answer on that.

Mr. VOLKMER. It does have implications because it would be directly from the private sector, while we do the negotiations. We do not have direct control over that satellite. Therefore, I can see some problems. Maybe they are unfounded.

Secretary BALDRIGE. I had better get back to you with how we plan to handle that. I see your point. I am not able to say right now how we would handle it.

Mr. VOLKMER. Thank you, Mr. Secretary. I am finished but I have one other thing here, if your staff can provide it later.

We have found that your statement has been quite in demand. There have been some in the audience, we have found, who have not been able to obtain a copy of it. If there is anyone who does not have a copy of it who is in the audience and who would like to have one, we can have a signup sheet. I am sure, Mr. Secretary, if we provide you with the names and addresses, you would provide them with a copy of your statement; is that correct?

Secretary BALDRIGE. It is the least we can do.

Mr. VOLKMER. Thank you very much. It has been quite in demand.

Mr. SCHEUER. Congressman MacKay?

Mr. MACKAY. Mr. Chairman, I will be very brief.

I am a new member of this committee, Mr. Baldrige, and I am trying to get an understanding of how the decisions are being made. It seems to me this program was approved by the Congress at the recommendation, presumably, of this committee 10 or more years ago, and it was a research program and there was a set of expectations for the research.

One of the things that justified the spending of probably hundreds of millions of dollars by this time was the expectation that the Thematic Mapper would provide a set of baseline data over a period of years from which you could thereafter measure changes in the environment of the Earth, from which we could perhaps predict whether these changes are affecting the habitability of the Earth. It is a very important set of data.

We do not have that data yet. The Thematic Mapper, as I understand it, operated—it was on Landsat IV—it operated a few weeks, and it is not now operational. Not only do we not have the data, but we will never be able to get the baseline unless two other satellites are launched. Apparently, the administration does not contemplate funding those satellites.

What I am seeing now, as a newcomer, is that we had a problem which we all agreed was an important problem. It had to do with basic research. The problem has not been solved. We are now proposing to commercialize it. Your written statement indicates the things which the President said have to happen. They have to do with defense, foreign policy interests, weather service, and a "good deal", which I guess means economically it has to make sense.

What do we do now—start another research project?

I do not mean to be argumentative, but the question I am trying to ask is, Should not we expect the administration in timing these decisions about commercialization or privatization to take into account the accomplishment of the original project for which we spent the hundreds of millions of dollars?

Secretary BALDRIGE. Yes. I would like to answer you, and then I would like to ask Dr. Calio to add whatever comments he would have.

As I stated earlier in this testimony, I cannot state this as the administration position, but I can state it as my own position. Through two administrations now there has been a lot of support, and both Presidents have enunciated this policy of turning Landsat over to the private sector. That, inevitably, creates an atmosphere, when you have tight budget deficits or large budget deficits, of looking for ways to cut.

I personally—and this is, as I say, my position, not the administration's position—feel that we should keep technological leadership in both these areas. Feeling that way, I think that to go through what we are doing now is the best way to keep it. I believe there is a chance, a real chance, that the private sector will be able to do that better than the U.S. Government with its strictures.

However, let's suppose that there were no one proposal that could accomplish all of the things that we have talked about today, and so we decided that it was not proper to send these satellites back to the private sector. Then I can guarantee you, Mr. Congress-

man, that I would be in the forefront of the fight in the administration to increase Government funding to the point where we needed it to keep ahead in both of these areas.

However, I think this is one of the steps that inevitably we should go through in order to prove, for once and for all, whether it is timely to transfer these to the private sector. If we get the right kinds of bids, we could be ahead of the game. If we do not, then we should look on this as a Government entity and finance it that way, if it is determined to be the administration's policy to keep ahead in technology. I would, as I said, fight for that particular position.

I do not know if that completely answers your question, but I would like to ask Dr. Calio, who is with us here, if he has any comments on that.

Dr. CALIO. The Secretary has stated a basic principle, and that is what has been applied for the past 20 years. The only thing I can give you now is specific examples of how both meteorological systems and the Landsat systems have a research complement and an operational complement, if you will. That will continue to exist when we break out the operational component, as the various elements of those systems mature and are used.

Both systems have the operational components to them today. I do not see the research and development stopping in the land remote-sensing systems. I believe on the drawing boards today in NASA are new sensors beyond the thematic mapper.

We have requests for R&D for new sensors for the meteorological satellite. I do not see that stopping in the future. The operational and experimental components run together.

Secretary BALDRIGE. If I may add one more point, Mr. MacKay, what I am obviously hoping will happen—I do not know that it will, but what I am hoping is this: I see both the Japanese and the French coming up with land satellites, remote-sensing satellites, that are technically ahead of ours. They are both going to come and try to sell their services in the United States as well as other countries around the globe. They are doing that by trying to expand the market for these services. They are using their private companies, and they are coming over and doing market surveys, talking to people, and they are trying to figure out what can we offer them that they do not get from Landsat now that we could give them with our satellite.

My fear is that as that process keeps on going, with their marketing abilities being reflected then in whatever the new markets they can uncover, that will drive their next technology, and they will adjust to improve it or put something new on.

In the meantime, the U.S. Government is not in the marketing business. We are not good at it. We do not pretend to be. I have not seen anything that is going to change us yet, unless we can somehow get this into the private sector to do the same kinds of things that the French are doing with their private companies. I think that will help drive the technology to one country's or another's advantage.

Mr. MACKAY. I guess the only point I am making is at the time the administration makes a recommendation I would hope that a fundamental part of that recommendation would be a statement as

to how the commercialization of these programs would assure the continuation of the basic research for which we originally invested the money. I do not see that in your written statement, and I do not see that in what you say the President laid down as ground rules. It seems to me that the presentation Dr. Taranik is going to give—and I understand he is one of your consultants, or has been—which is going to start in 10 minutes at the Library of Congress, expresses the views of the scientific community that the scope of research inadvertently is going to be narrowed, diminished, or cut out by virtue of this change—it seems to me that has to be taken into account. This is the committee that has to take that into account.

Secretary BALDRIGE. May I bring up the other side of that question, which possibly a scientist might not dwell on that much?

The fact is that if anyone taking over our present Landsat at just where we are now, who made a proposition to do that, does not do the kind of research that is going to improve that and keep us ahead technically, he is going to be run out of business by our competitors. That is the biggest driving force behind that, because the French are doing it in consortium with their private companies and the Japanese are doing it.

If someone just took Landsat and said: "Well, I'm going to cheap this out, not put any money in research," he would be out of business pretty soon.

Mr. MACKAY. Mr. Baldrige, the research I am concerned about is not research for which there is now a commercial market or for which there will ever be a commercial market. It is research that Government needs for Government purposes and for purposes of the common good of all the people. Because we are fouling our nest, how are we going to be able to continue living in this world. Until we get a baseline, no one is ever going to know.

Secretary BALDRIGE. On that specific point, we would have the ability in our list of things here that we put in the RFP and make people agree to—we would have the ability to handle that research. We would have to pay for it, but we would handle it as a Government by reserving x amount of sensors, or whatever, so that there would not be the problem at all of working that out with a company involved. I am sure they would be delighted to have that. The problem would rest with the U.S. Government. If the scientists at their next meeting try to make it differently, I would have to respectfully disagree with them.

On your point of: Are we doing enough research, that would be a Government policy problem, not a private sector problem. For that basic research, we would have to have an administration policy, whoever the administration was, that they wanted to do this, and then they would have to pay for it in the same way as everybody else would, but we would have the ability to reserve the time or the number of sensors, or whatever, however you want to describe it on this. That would be part of the RFP.

Mr. MACKAY. All right. Thank you.

Thank you, Mr. Chairman.

Mr. SCHEUER. We are rounding third base, I think, Mr. Secretary, and we are headed toward home plate. Let me just continue

with the threads that we have been weaving into a beautiful tapestry.

On December 17, 1982, 2 days after the Cabinet Council on Commerce and Trade meeting, Mr. James Wilderotter, an attorney representing Comsat, sent Assistant Deputy Secretary of Commerce Michael Bayer a memorandum outlining a plan for soliciting and evaluating proposals for commercialization. First, do you have any view on how Mr. Wilderotter learned of the confidential conversations and meetings of the CCCT [the Cabinet Council on Commerce and Trade], less than 2 days after the meeting? Second, what is your view of the propriety of a potential bidder, an almost sure bidder, advising Commerce Department officials on the implementation of a potential Presidential decision?

Secretary BALDRIGE. Well, I can't blame him for trying. That is like any other lobbying effort.

However, Mr. Chairman, there is not one major policy decision on these kinds of matters that does not come across my desk. I have to bring to bear on these questions all the experience that I have had in 25 years in the private sector.

It is possible that somewhere down the ladder maybe someone could try to slip one by that might favor one company or another—not just Comsat but there will be some others in lobbying—but this is essentially a working group composed of all of the parts of the Congress. I do not see any way for that to be influenced by any particular company.

Now as to how Mr. Wilderotter knew about this, I am aghast at the leaks we see in the Government from all sides and all kinds of issues. This was in the paper, I believe, the day after. Our whole Cabinet Council discussion was in the newspaper on December 16 or 17. It was reported. I am not going to say whether it was reported correctly or not, but it was reported.

I think that probably Comsat knew about that even before the newspaper thing came out, and I do not know where they heard about it.

Mr. SCHEUER. I think it is fair to assume they heard about it or knew about it before Congress heard about it or knew about it.

Secretary BALDRIGE. Yes, but it is not fair to assume that it automatically came from the Commerce Department because I have some other thoughts about where it came from.

Mr. SCHEUER. Well, tell us where it came from.

Secretary BALDRIGE. I know there are leaks in the Government.

Mr. SCHEUER. Where did it come from, in your opinion?

Secretary BALDRIGE. Well, it is not based on fact so I would not want to give it, but that is one of the big problems in our Government, the leaks.

Mr. SCHEUER. All right. It may be a big problem, but it is not a new problem. I guess it has plagued governments of both parties since time immemorial, so I do not feel it is your particular Administration or that the Commerce Department has been unduly prejudiced in this matter. It goes with the turf, Mr. Secretary.

Now on February 7, 1983, Mr. Wilderotter sent Mr. Bayer another memorandum relating to a draft internal Government report on satellite commercialization. Now this report was mandated by

Public Law 97-324 and was to be submitted to Congress by February 1.

Do you know what Comsat's role was in editing the draft report?

Secretary BALDRIGE. No, I don't. I have no knowledge of that.

Mr. SCHEUER. Do any of you know which, if any, of Comsat's comments were incorporated into the final version of the report which was submitted 2 months late, in April 1983?

Secretary BALDRIGE. I am not aware that any of Comsat's comments were put in there. I am not aware or unaware of it. I do know why the report was late. It was because we were anticipating a Presidential decision very soon, and we wanted to be able to anticipate that in the report, but we did not know which way the President was going to decide. He did not decide until March 8.

That was a major reason for the delay. I would say another reason was that our well-known reputation for efficiency in the Commerce Department probably was at its nadir at this time because that went back and forth from "exec sec" and so forth. We took too long at it. There is no question about it. However, the major reason was we wanted to be able to anticipate a Presidential decision, and he had not made it yet.

Mr. SCHEUER. Do you know if any other private firms besides Comsat were enabled to see these two documents and comment on them?

Secretary BALDRIGE. I am not sure that Comsat was able to see them. I have no knowledge that they were given to Comsat.

Mr. SCHEUER. Mr. Secretary, we understand that last Friday Mr. Fiske and Mr. Bayer both recused themselves from any further involvement in this issue. Can you tell us why they did that?

Secretary BALDRIGE. Deputy Secretary Fiske came in and told me that he had had some conversations with Comsat about a potential employment opportunity. He said that he wanted to voluntarily disclose this, that they had not gotten as far as to talk about salary or a specific position. He had withdrawn from those talks. I thought the only proper way to handle this was to turn it over to our general counsel as the chief ethics officer, and he determined that there was at least the appearance of an impropriety, with which I obviously agreed. Because of the possibility of the appearance of impropriety, Mr. Fiske recused himself.

Mr. Bayer, as a member of Mr. Fiske's immediate office, was also recused, as were the other members of Fiske's immediate office, so that we avoid the appearance of impropriety. Otherwise, I thought we would face this being brought up interminably because he was talked to about coming to work for Comsat.

Mr. SCHEUER. Can you tell us how many of these interviews he had and the dates of the interviews? That would shed a little bit of additional light on whether there was an appearance of impropriety or whether perhaps impropriety itself might be involved.

Secretary BALDRIGE. I cannot tell you the dates, but there were, I think, three instances where this was brought up in his presence.

Mr. SCHEUER. The dates would be important.

In view of the extraordinarily close relationship that Comsat seemed to have and in view of the unprecedented input that Comsat seemed to have along the line as you reversed the April 20

position of the CCCT, the Cabinet Council's position, I think it would help illuminate——

Secretary BALDRIGE. We would be glad to do that, Mr. Chairman, but Fiske had nothing to do with policy in this. He had nothing to do with reversing this decision. The way I run the Commerce Department, I did it with Joe Wright, my first Deputy, and Fiske—they are day-to-day managers. I have to spend so much time on policy and make all of the top policy decisions myself, so that any fault in here that you may find with decisions that were made——

Mr. SCHEUER. Nobody is finding fault.

Secretary BALDRIGE. No, but I mean it would be on my head, not anybody else's in the Department.

Fiske's job was a day-to-day management, the pushing along things to completion. My job is the policy part.

Mr. SCHEUER. Are you finished?

Secretary BALDRIGE. Yes.

Mr. SCHEUER. Wasn't Mr. Fiske selected originally as head of the commercialization implementation team, a team to supervise and effectuate the whole commercialization process?

Secretary BALDRIGE. Yes, to push the process through the Commerce Department, but I was the Chairman of the Cabinet Council on Commerce and Trade and, believe me, all of those policy options were my decisions, not his.

Mr. SCHEUER. I just want to make it clear for the record. He was head of the team involved in expediting this whole matter since the President made his decision on a multibillion dollar transfer of Government assets.

Secretary BALDRIGE. Since the President made his decision, you say?

Mr. SCHEUER. No, since—in the past few weeks, has he not been designated as head of the team that is going to effectuate this entire transition?

Secretary BALDRIGE. Well, I don't——

Mr. SCHEUER. Making all the operational nuts-and-bolts decisions that are involved. I am just suggesting——

Secretary BALDRIGE. As Deputy, that is his job.

Mr. SCHEUER. For a fellow who is contemplating going with Comsat, making all the nuts-and-bolts decisions on the process of transfer I think suggests certain questions that might probably as well have been avoided by his making an earlier divulgence of these meetings that he had about possible future employment, if they took place before his designation.

All right. Let's move on. I think we have explored that usefully.

On page 2 of your testimony—and I am reverting to the conversation that you and I had yesterday or the day before—you note that one of the groundrules for the transfer is that no transfer can take place unless the data that the Weather Service needs to offer the public the services it now provides is guaranteed. Now that would indicate a freeze on the quality and quantity of the Weather Service, that whoever takes over, if that were to develop, is obligated only to continue doing what the weather satellite is now doing.

In view of the fact that there is an explosion of progress taking place in the field of satellite communication, telecommunications of all kinds, why would we want to limit the Weather Service to pro-

viding the public with the service it now provides? Shouldn't the transfer make it imminently possible for the Weather Service to improve its level of operations and constantly remain at the state of the art?

Secretary BALDRIGE. You are exactly right, Mr. Chairman. I would describe that as a poorly written paragraph because you can draw the wrong inference from it. I think what I was trying to emphasize previously was the fact that there is not going to be any change in the present system. I should have used another way of putting it, and the safeguards that we are putting up on the RFP——

Mr. SCHEUER. What is the sense, without getting into technical phraseology, what is the sense of——

Secretary BALDRIGE. Just one quick sentence, not quick but it is one sentence.

The contractual terms will provide for National Weather Service control over changes in the data supplied by the private sector vendor and for adjustments to meet new needs through modifications to the basic contract. As we see the state of the art develop and new advances made, we would have to have the ability to make sure those were incorporated in the satellites.

Mr. SCHEUER. Right. Now this, to me, is one of the real complications of putting all of this, putting the whole satellite system in private hands. This very building that you are sitting in, Mr. Secretary, went astronomically over estimates, the Rayburn Building. The big problem was not that they were not able to build the basic building as provided in the plans and specs for the dollars. It was the change orders.

In most of the overruns that we find in the Department of Defense procurement program the big problem comes in change orders. It is when you want to change a contract that the private sector company really has you—I do not want to use a vulgar expression, Mr. Secretary—but they have you trapped in a corner. They have you——

Secretary BALDRIGE. By the "cojones." How about that?

Mr. SCHEUER. By the "cojones." Thank you, Mr. Secretary. [Laughter.]

You are my kind of guy.

If the Government is in charge and 6 months or a year after they put something up in the air the Japanese or the French or Silicon Valley or AT&T or IBM or Comsat come to them with a real breakthrough, where maybe scientific development had pooped along and pooped along and pooped along, and bang, there was a critical mass, a leap forward in the technology. Guys like you could scratch your heads and say, "Well, we spent $3 billion to get that up there, but this new technology is so breathtaking and is so exciting in its potential that from the point of view of the public interest we have to do it. We are going to take our lumps. It is worth it from the point of view of the taxpayer."

However, if you have a private sector firm out there that has a 10- or a 15-year contract—and, from what we hear, that is what Comsat is looking for; they are talking about 15 years—and you want to take advantage either of a breakthrough that Comsat or anybody else has developed, or has developed from any other

source, you have a hell of a problem on your hands. How do you propose in the contract that would be developed for the private sector—how do you propose to enable us to do what you say very clearly you want to do and which we applaud you for wanting to do, which is: namely, always have the opportunity to take advantage of the state of the art, whatever advances in new technology seem to be appropriate for application here?

Secretary BALDRIGE. We would have to have that written in very clearly, Mr. Chairman. There is no question about that.

You are exactly right on the possibility of that happening. We would have to have that written in the RFP. I am not sure about the right technical language today, but when we come down and show it to you we should have your concerns addressed.

Mr. SCHEUER. If Comsat were to come to me and say: "We are going to hire you to advise us," if they could get around the criminal statutes involved in that, I would say: "Look, you're going to make a hell of a big investment, and you've got to amortize that investment. Therefore, from the business point of view, you had better make sure that if you are selling the Government services you have them locked up good and proper." I give them that advice right now for free. We do not have to violate a criminal statute.

I presume you are going to be facing that problem and that we will have a chance to talk about that in the months to come?

Secretary BALDRIGE. Yes.

Mr. SCHEUER. Good.

Both in the Cabinet Council discussions and in your testimony—and I must say your testimony has been extremely enlightening and you have been a wonderful, forthright, friendly, and sophisticated witness. We have all enjoyed it. You seem to have narrowed your options to two, to either selling the land and weather satellite systems, or both, or, if no RFP responses are suitable, letting Landsat wither on the vine and perhaps die by 1988. I do not want to put words in your mouth. Is this more or less an accurate statement of the options which were presented to the President in the decision memorandum?

Secretary BALDRIGE. Yes, because the Landsat decision, the decision not to fund Landsat after—when was it, whatever year it ceased, 1988—was not the purview of the Cabinet Council at that time. It was a budget decision, and it was the Administration's position. The Administration had already taken that position.

Mr. SCHEUER. The Administration what?

Secretary BALDRIGE. Had already taken that position, because it was in the budget submission to Congress. OMB, in effect, has to follow that particular line unless it is changed.

Now, as I testified earlier, if this effort does not work out in the transfer to the private sector, I will personally be trying to change that, but I cannot say that is the Administration's position because it is not. It is clear right now.

Mr. SCHEUER. If none of the responses to your RFP are viable, suitable, how quickly would funding have to be provided to Landsat to keep it alive and, moreover, to bring it into a posture of being internationally competitive? Right now it is dying on the vine. Right now the French and the Japanese are clearly headed in a di-

rection where they are going to operate a very much superior facility.

Secretary BALDRIGE. This sounds like an oversimplified answer, but I do not know what else to give. We have one up there now and we have one in the barn. If they last 3 to 4 years, let's say the one we have up fails next year. We would have another 3 years. However, to get one ready would take 3 years, 3 to 4 years.

I want to be careful.

Mr. SCHEUER. Would it be a fair paraphrase of your position to say that, based on what you have just told us, if we want to remain internationally competitive, we have to get on the stick and fund that operation over this 4-year pull right now—I mean real pronto?

Secretary BALDRIGE. Well, I would say "pronto" after this decision on the RFP.

Mr. SCHEUER. Isn't there something illogical about making this massive general decision on how to organize institutionally our future land and weather satellites when you have provided as a given that the Government is going to stop funding Landsat? Isn't that—shouldn't that really be made, that decision, as part of the overall decision as to how we are going to structure responsibility for a design implementation operation of the whole macrosystem, dividing responsibilities and roles between the public sector and the private sector? Shouldn't this decision on phasing out Landsat and letting it wither on the vine be suspended until the whole ball of wax could be considered?

Secretary BALDRIGE. Mr. Chairman, the reason that OMB took the budget decision that they did was because of the decision to try to transfer this to the private sector. It would not have taken that position without that. It is time for us to make a movement in that direction, as we are doing. We have been talking about it for the past 5 years, and we will never find out whether that is going to work unless we go out and take the bull by the horns, like we are doing right now, or trying to do.

If this effort is not successful, then I think we have to revisit immediately the Landsat funding.

Mr. SCHEUER. That is a position you might want to try to sustain. To me, the clear merit—the meritorious posture would be to consider the whole ball of wax at one time and not presuppose an answer of commercialization and make the decision to, in effect, wipe out Landsat when you really have not done your homework and you have not, either for yourselves or for Congress, answered many of the broader technical questions and public policy questions and economic questions that would be your intellectual underpinning for the decisions on the whole scheme of operating Landsat and Metsat.

Secretary BALDRIGE. I think we have done as much homework as we can do without going and finding out, Mr. Chairman. We ain't never going to find out unless we go out and look. You can have all the studies, and they can go on for years, and they will be conflicting, and they will say, well, in this hand and on the other hand, but there is only one way to find out. That is what we are doing.

Mr. SCHEUER. Mr. Secretary, I tend to agree with you, but I still would feel more comfortable if your Department had at least done a simple 10-, 20-, 30-, 40-, 50-page economic analysis, feasibility

analysis, cost-benefit analysis, call it what you will, that the Rand Corp. could do for you probably, that OMB could do for you, and that has not been done.

I admit that when you get those RFP's back you are going to have the information that is going to be very valuable. You are going to get some real life data there, real world experience, and there is no substitute for that. However, it seems to me that you would have—that it would have made the process of putting out the RFP's a little bit more focused if you had had some really hard-hitting, sophisticated economic analysis. It would not only help the Government make this decision, but it would have helped some of the private sector companies also.

I think we have about run out of steam here. Do any of the other Members have any questions?

[No response.]

Mr. SCHEUER. Do you have anything else you would like to say, Mr. Secretary? I think we are ready to break for lunch?

Secretary BALDRIGE. No. I am about run dry.

Mr. SCHEUER. OK. Let me say you have been a superb witness. We have thoroughly enjoyed it.

[Whereupon, at 1:04 p.m., the committee recessed, to reconvene at the call of the Chair.]

THE COMMERCIALIZATION OF METEOROLOGICAL AND LAND REMOTE-SENSING SATELLITES

TUESDAY, JUNE 21, 1983

HOUSE OF REPRESENTATIVES, COMMITTEE ON SCIENCE AND TECHNOLOGY, SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS, AND SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT,
Washington, D.C.

The subcommittees met, pursuant to call, at 9:55 a.m., in room 2318, Rayburn House Office Building, Hon. Harold L. Volkmer (chairman of the Subcommittee on Space Science and Applications) presiding.

Mr. VOLKMER. The subcommittees will come to order.

Today we reopen our hearings on the proposed sale of Landsat and the weather satellites. The hearings began on April 14 when Commerce Secretary Baldrige testified before us. In holding these hearings, we are at once indicating that we have an open mind—we want to hear more testimony—and, accordingly, we feel that many issues remain to be addressed.

Personally, I have several serious questions both as to the procedures being followed and as to the substance of the issues. First, on the substance, let me mention just a few considerations.

Is commercialization of the weather satellites in the best long-term interest of the Nation? I want to hear what all the witnesses have to say about that.

Is civil remote sensing a "natural monopoly" like an electric utility? This is very important because if one company is given a guaranteed Government data-purchase contract and also given exclusive use of Government-assigned communications frequencies, then this would establish a monopoly de facto.

Can we bring the strengths of the private sector to this field if we don't have continuing competition? This would mean day-to-day competition without Government subsidies, not just a one-time procurement which might be structured so that many small firms are discouraged from bidding.

Finally, at the April 14 hearing, I asked about how the international exchange of data would be handled by a commercial Metsat operation. I asked again in the letter dated May 5. So far, I have not received an answer. This is a very important topic, because many believe that we get data of great value to us in this exchange, and the marginal cost to us of providing the data to others is very small.

Now I would like to say a few words about the process that is now underway. I believe that the formation of a Source Evaluation Board is a great improvement over the backroom process that is now behind us. I assume that we have a new cast, and that the process will be above-board from now on.

However, the specific schedule for the SEB process certainly seems contrary to the intent of Congress when we passed title II of Public Law 97-324, and when we adopted the Bateman amendment to H.R. 2065, which was intended to "insure early, formal congressional involvement in setting the course for a possible transfer of the remote sensing satellite systems to the private sector * * *."

Therefore, an important question is, should we have legislation to guide this process? Can we expect industry to respond to an RFP if the rules have not been made clear? What provisions should be in any such "framework" legislation? Of course, in our system of government we cannot necessarily expect the executive branch to decide whether legislation is needed.

I hope that we will be able to fully explore these and other issues today and in the next three sessions of hearings.

At this time, I will recognize the gentleman from New Mexico for a statement.

Mr. LUJAN. Thank you, Mr. Chairman.

Secretary Baldrige testified at an earlier hearing on this issue that the President's decision was to consider the possibility of a transfer of remote sensing to the private sector. Much has been said and there is a misconception around that the decision was to sell off these satellites, but I want to reiterate to make the point that the decision was only to consider the possibility of transferring these remote sensing apparatuses to the private sector. Whether or not that transfer is implemented in all or in part or completely remains to be determined.

We need to carefully look at the Government needs and determine which approach is best in terms of those needs. This is a decision that will involve careful study by the Department of Commerce and other departments—State, Department of Defense, and so on.

One of our witnesses today, Mr. Kammer, hopefully will tell us more about how this input is being done. The decision will also involve input from Congress, which, of course, is the purpose of this and other hearings.

There are many factors to be considered in transferring the remote sensing capability. We have all heard discussions about the various financial aspects. It is still not clear whether or not there is sufficient market for Landsat data to support the high cost associated with this technology.

However, in considering these costs we should not require the private sector to reimburse the Government for the existing investment in research and development. We have not done that for other Government-developed technologies and we should not start now. If the Government would charge for its research and development costs, then there is little argument for Government to play a major role in the technology development.

The purpose of NASA, where remote sensing was originally developed, is to develop technologies and then spin them off to the

private sector. Commercialization of remote sensing is appropriate. The question is merely when and how this could be done best.

Mr. Chairman, I will be interested in discussing this with our witnesses today, and certainly want to welcome them here.

Mr. VOLKMER. At this time, I will recognize the chairman of the Subcommittee on Natural Resources, Agriculture Research and Environment, the gentleman from New York, Mr. Scheuer.

Mr. SCHEUER. Thank you, Mr. Chairman.

Three months ago, when we started these hearings, Mr. Chairman, I said that the Government, the administration, needed to satisfy several congressional concerns about the process of transferring the satellite. First, we would want to know that the plan for transferring the satellites would meet the legitimate security concerns of our country.

Second, we would want to know it would meet the legitimate concerns of our international relations, with the about 120 nations abroad that make extraordinarily heavy use of our weather satellites.

And, third, we would want to know that whatever plan was proposed was capable of tapping the full potential of the competitive dynamics of American industry, both during the selection process and in the years following.

And, most importantly, we want to be assured that Government would continue to provide the American people with the best possible available weather services.

Regrettably, Mr. Chairman, I don't think you feel that these concerns have been met. When we raised these concerns, we hear very solemnly intoned, "We are looking at that issue; we will take care of that problem when it arises." But we haven't had any hard assurances or hard evidence that these concerns will be met.

I think that the administration must look at these issues, and I think they must give us some assurances. And it seems to me the right time to give us those assurances and to think through these matters is before it issues an RFP, a request for proposals, and causes industry to spend hundreds of thousands of dollars, or, more likely, millions of dollars, in preparing these proposals.

Now, I agree with you, also, Mr. Chairman, that the proper method for ensuring that the American public is protected is by the open discussion that takes place in the framework of considering legislation, not by the issuance of an RFP which will draw a response from a very select group of commercial entities.

If one examines the evidence, it is almost inconceivable that the administration could seriously maintain the option of commercialization in view of the mounting evidence against it that is accruing daily. Only 1 out of 14 of the respondents to the Department of Commerce's request for information, the original RFP, endorsed sale of the weather satellite, and, of course, that came from Comsat.

Second, a joint Department of Defense/NASA study concluded, and I quote:

> There is considerable financial policy and program risk to the Government in commercializing weather satellites, and there is no clear policy or financial benefit to be realized.

Third, five other recent studies, Government studies, or Government-procured studies concluded that satellites were inherently governmental and that their commercialization should not be pursued.

The problem with the sale of the weather satellites is that it distracts from the real issue—whether the Government should maintain its technological lead in the area of land remote sensing satellites.

I think that Secretary Baldrige agreed with us in our April hearing that the land remote sensing satellite and how we cope with it, how we manage it, is the central issue in this debate. The longer we argue over the weather satellite and the policy shifts and the conflicts of interest which flow from the proposed sale of the weather satellite, the more we are allowing the land-based remote sensing capability to wither away.

Our system, our present land-based remote sensing satellite system, will die on the vine in approximately 4 to 5 years. The French are to launch their land-based remote sensing satellite in 1985, if I am not mistaken, Mr. Chairman, with firm Government support; and the Japanese are about to hit the deck at about the same time. This is what we should be concentrating our efforts and concerns on.

How do we maintain our technological lead here, and why are we in the process of creating a self-fulfilling prophecy of failure by starving, over a period of several years, the land-based remote sensing satellite and virtually forcing it into disfunction when we have planned nothing to replace it, and we are virtually handing our position of technological superiority to the French and the Japanese on a silver platter?

This is what gives me deep concern. This is what we in the Congress and the administration ought to be addressing right up front now.

Thank you, Mr. Chairman.

Mr. VOLKMER. Thank you, Mr. Scheuer.

Mr. BATEMAN. Very briefly, Mr. Chairman.

First, if I might be permitted to do so, I would like to ask unanimous consent that a statement of our colleague, Congressman McGrath, be entered into the record in view of his inability to be here to put it in the record personally.

Mr. VOLKMER. It will appear in the record right after your statement.

Mr. BATEMAN. Mr. Chairman, thank you.

I would like to say, first of all, that for a subject that I am intensely interested in, unfortunately I find that I have a markup in subcommittee and will not be able to stay through the hearings, as much as I would like to.

But I would like to suggest that when we acted in committee in terms of the language that was inserted in H.R. 2065, I think we clearly manifested an intention on the part of the Congress that the commercialization issue, while not something that we in any sense were trying to discourage or to deter from happening, as long as it happened on a satisfactory basis, did require a very meaningful congressional input, and that it is an issue that poses a number of very broad public policy concerns that properly are the province

of the Congress. And pursuant to those notions the language that we inserted in our bill requires a comprehensive statement of recommended policy procedures, conditions, and limitations to which any transfer—that is, to commercial operations—should be subject.

What we really are saying there is that the Congress should receive such a statement pursuant to the statutory mandate, assuming final passage of the bill. And having received it, Congress would then need to enact a law pursuant to which any further steps toward commercialization would be taken.

I don't know whether we are going to hear today that someone is in the process of preparing this comprehensive statement of recommended policies, et cetera—but clearly this was the intent of the Congress when we acted. And it is my understanding that the Senate committee has incorporated the identical language in its version of their legislation. I hope we are going to learn that a comprehensive statement of policy, procedures, et cetera, is in the process of being prepared and will indeed be presented to the Congress as a basis for Congress then enacting general legislation.

A part of our thinking having been—and certainly part of my thinking having been—that we should not have the executive branch requesting proposals in advance of having determined how the public policy issues should be addressed and that it would not be fair to those who are requested to make proposals, to go forward and do that without the Congress having resolved the public policy issues, and certainly not fair to the Congress to proceed with a request for proposals which came in and then find that all that we were in a position to do would be to more or less select among those who had made a proposal, because I do not want the responsibility and I don't think the Congress wants the responsibility for determining who should get a contract, if there are to be any contracts—our role should be that of determining the public policy, and that need be done before you can meaningfully structure a request for proposal that would be fair and sound and which the Government would be in a position to stand behind if some company receives it and chooses to make a proposal.

That is a longer statement, Mr. Chairman, than I intended to make. But I thank you for the opportunity to make it.

[The prepared statement of Mr. McGrath follows:]

HONORABLE RAYMOND J. MCGRATH
HEARING ON REMOTE SENSING SATELLITE COMMERCIALIZATION
JUNE 21, 1983

THANK YOU, MR. CHAIRMAN.

I AM VERY PLEASED THAT WE ARE BEGINNING THIS SERIES OF HEARINGS REGARDING THE PROPOSAL TO TRANSFER OUR REMOTE SENSING SATELLITES TO THE PRIVATE SECTOR.

IT HAS BEEN TWO YEARS SINCE THIS ISSUE FIRST CAME TO MY ATTENTION, IN A JOINT HEARING HELD BY THE SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS WITH THE SENATE SUBCOMMITTEE ON SCIENCE, TECHNOLOGY AND SPACE. I RAISED A NUMBER OF SERIOUS CONCERNS AT THAT TIME, AND I STILL HAVE THESE SAME CONCERNS. IN MY OPINION, WE HAVE YET TO RECEIVE ANY INFORMATION WHICH CONVINCES ME THAT SUCH A TRANSFER WOULD BE IN THE NATIONAL INTEREST AND A GOOD DEAL FOR THE AMERICAN TAXPAYERS. NEVERTHELESS, I AM GENERALLY IN FAVOR OF THE COMMERCIALIZATION OF SPACE TECHNOLOGIES, AND I LOOK FORWARD TO THE TESTIMONY OF OUR WITNESSES WHO MAY BE ABLE TO PUT TO REST SOME OF THE SERIOUS CONCERNS WE HAVE.

I AM PLEASED THAT WE HAVE A WITNESS BEFORE US TODAY FROM THE DEPARTMENT OF COMMERCE. WE HAVE PREVIOUSLY BEEN ASSURED OF CONGRESSIONAL INPUT IN THE DECISION-MAKING AND I HOPE THIS WILL BE THE CASE AS THIS ISSUE IS EXAMINED, AND THE REQUEST FOR PROPOSALS IS PREPARED BY THE SOURCE EVALUATION BOARD.

Mr. VOLKMER. Thank you.

Now, Dr. Gibbons, your statement will be made a part of the record, and you may either summarize or review the statement in full, however you wish to proceed.

STATEMENT OF JOHN H. GIBBONS, DIRECTOR, OFFICE OF TECHNOLOGY ASSESSMENT, ACCOMPANIED BY PETER SHARFMAN, PROGRAM MANAGER, INTERNATIONAL SECURITY AND COMMERCE PROGRAM, OFFICE OF TECHNOLOGY ASSESSMENT; AND GORDON LAW

Mr. GIBBONS. Thank you, Mr. Chairman.

I will submit a complete statement for the record that is inappropriately long to present to you this morning.

Mr. Chairman, it is also my pleasure to have with me this morning Dr. Peter Sharfman, who directs the program at OTA on the International Security and Commerce, which includes a high percentage of our present space related work.

My testimony this morning is based in part on the findings of OTA's 1982 assessment entitled "Civilian Space Policy and Applications" and on our technical memorandum which was released in March by your committee, entitled "Unispace '82: A Context for International Cooperation and Competition."

We are presently engaged in a third assessment of the international cooperation and competition in civilian space activities, also requested by this committee and by the Joint Economic Committee.

My testimony this morning reflects the findings to date in these studies.

My testimony has three parts. First, I want to summarize briefly the current state of land remote sensing policy and to explore the issue associated with private ownership and operation.

Second, because U.S. foreign policy and international relations are central to the discussions of satellite remote sensing, I want to discuss the issues that transfer of remote sensing to the private sector would raise in these hearings.

And, finally, I will comment on the nature and the state of foreign competition in Earth remote sensing.

The land satellite remote sensing system has clearly demonstrated the utility of space based land remote sensing for a wide variety of research as well as resource exploitation and management purposes. The technology has been proven and it is ready for operational status. There is now a small number of customers within the United States and foreign government agencies as well as in the private sector.

While some of the applications of land remote sensing can be carried out on an ad hoc basis, most customers require time series data and assurances that comparable data will continue to be available. Therefore, the following questions need to be answered:

Should the United States establish an operational civilian land remote sensing program? If so, what form should it take and what will be the economic, social, and political costs? If not, what will be the costs of not doing so?

What international and foreign policy implications follow from any proposed course of action?

The questions have been with us for several years; and yet, while the United States continues to deliberate, the French are building a subsidized but private commercial system. The French SPOT remote sensing satellite, which is scheduled to be launched, as Mr. Bateman pointed out, in 1985, will be simpler, cheaper, and yet in certain respects more capable than the U.S. Landsat satellite. At least six other countries are also now planning operational remote sensing systems.

At the present time, Congress is faced with an administration decision, or at least proposal, to transfer the Landsat system to the private sector as soon as possible. OTA believes that the implications of that decision have not been adequately considered. Most of my testimony now will be devoted to exploring these implications.

Four major options for treating Earth resources remote sensing are open to the Federal Government. First, the Government could continue to operate a civilian land remote sensing system for the public good; second, it could seek to establish and participate in a multinational consortium which would own and operate a land remote system; third, it could see the system transferred to the private sector; and finally, it could, if it chose, decide to withdraw completely from an operational civilian land remote sensing program after Landsat D′ and continue to do only research and development.

One additional option, Mr. Chairman, sometimes is mentioned, and that is of simply using suitably degraded data taken from classified satellites. However, because civilian and military intelligence satellites serve very different purposes and produce very different kinds of data, this option is not really feasible for most civilian applications.

Of the above courses of action, only that of withdrawing completely from providing operational services would appreciably reduce future Federal budget outlays for remote sensing. Successfully transferring the Landsat system to the private sector would involve substantial subsidies for an extended period because the Landsat satellites are not optimal designs for commercial use; they are research and development satellites. Moreover, the total market for land remote sensing data is currently very small, and of that small market, 85 to 90 percent of it is, in fact, a Government market.

Although several analysts predict that with proper encouragement, the use of satellite data will expand and grow into a major business, uncertain Government policy has inhibited potential customers here and abroad from investing in the analytic equipment and personnel they need to use Earth resources data most effectively.

Some analysts believe this has inhibited the development of market for data. How large the market could be if data continuity over a number of years were assured, no one really presently knows. However, we feel that if the Government were to guarantee the availability of timely moderate resolution multispectral data for perhaps a 5- to 10-year time period, and at a reasonable price, it could become apparent over that time whether the market would indeed grow large enough to support a truly commercial operation.

Now I would like to talk about some policy options, Mr. Chairman. First of all, with respect to continued Government ownership, if providing remote data sensed by satellite is considered sufficiently important to the Nation's foreign policy, national security, research and leadership objectives, the Government could continue to own the system. In spite of the current resolve to transfer the responsibility for providing U.S. satellite remote sensing data to the private sector, there is still a plausible case to be made for retaining responsibility for a system in the Government on the grounds that it provides a worthy public good and that the Government itself remains clearly the largest single customer.

What about a multinational consortium? This option would be to establish a satellite remote sensing system owned and operated multinationally. Under this arrangement, a single multinational management authority would assume responsibility for global operation of a system, including establishing technical specifications, procuring and operating satellites, and receiving and preprocessing data.

Although satellite remote sensing is likely to be of greatest utility over the long term to the developing nations, with the current climate in the U.N. toward remote sensing, a U.N.-organized consortium is, we feel, not likely to work. It would, in principle, be more feasible or practicable to establish a limited consortium among the nations interested in participating, similar in form to the Intelsat structure. However, the commitment of the French now, and several other countries, to their own national systems might make it quite difficult to reach an agreement on such a consortium.

What about options for prompting the transfer into the private sector? The eventual goal of such a transfer into the private sector or of any Government R&D into the private sector is to contribute to a self-sustaining business. Among the many possible variations, let me mention three.

First the Government could contract with one or more private firms either to provide a direct subsidy or to purchase data at an agreed price, that would enable sufficient support for continued operation and development. Alternatively, a laissez-faire approach with competitive bidding to supply data for Government needs is possible; or a mixed, phased strategy that would allow private vendors to build a market over time, while still retaining partial Government ownership during that period of time.

Several factors need to be assessed for such a transfer: The cost and performance of the satellite system; the size of the market; and the operator's ability to receive and process high data flow from the satellite. Landsat, for example, was built as a research and development system. Its operational costs are too high compared to the total revenue and fees to sustain a commercial enterprise.

Without a strong market for data and information products, certainly no commercial operation is likely to be successful. The current revenue from Landsat data is about $10 million annually, compared to an operations and maintenance cost of about $23 million for fiscal year 1983. In addition, the decision by the administration not to guarantee data continuity through the 1980's has certainly inhibited growth of the market.

It is clear that the global market for primary data is not likely to grow large enough to support a nonsubsidized commercial system, unless the system costs can be markedly reduced and proper attention is given to the marketing of data.

Successful commercialization of an Earth resources system also depends highly on advances in information technology that will make data manipulation, distribution, storage, and retrieval simpler and less expensive. This is because the products derived from satellite remote sensing bear a closer relationship to the information industry than they do to the space industry.

Now, Mr. Chairman, I would like to turn to a couple of international issues. Commercialization would also raise a variety of international issues which OTA feels have not been adequately considered. Yet, outer space is inherently an international realm, subject to international treaty and agreements between governments. Data products from the Landsat system as well as the two weather satellite systems have served as important instruments of U.S. foreign policy by allowing the United States to share its technological expertise and to create goodwill for U.S. national interests.

I will pose these issues to you as five questions. The first question is: What data policies would private owners be required to comply with? For Landsat, the United States still follows the long-established nondiscriminatory policy of supplying data in as timely a manner as possible to any nation that wishes to purchase them. This policy is an important reflection of our principles as an open society and was a significant factor in our ability to develop the Landsat system with little protest from the world community.

The second question: What relationship would a private firm or firms have with foreign Landsat receiving stations? The foreign ground stations are all local government-owned and operated, and they receive data directly from the Landsat satellite by agreement from the U.S. Government.

For a certain annual fee, these stations receive and preprocess the data and sell data products to their customers. In turn, they agree to abide by the same nondiscriminatory sales policy practiced by the United States. The data are available to all comers.

Third, how would a private company and the Government deal with the political and economic concerns of many developing countries? Other countries are well aware that the possession of remotely sensed data and the ability to analyze those data gives others power to effect their own resource development. Private operation of the system could heighten suspicions that such data would be used to gain competitive advantage or that data on crop conditions or military activities might be sold preferentially to political or economic adversaries.

In addition, some countries object to the U.S. policy of open distribution of data from Landsat. However, the United States has consistently opposed the effort to limit the distribution of Landsat data on the premise that any regime which arbitrarily controls resource information is incompatible with the U.N. doctrine of the international free flow of information. The entire issue of prior consent to distribute data about a country was of deep concern at the Unispace 1982 conference. It will continue to be a major issue

in the U.N. Committee on the Peaceful Uses of Outer Space and other international forums.

What Federal oversight will be needed for the various international treaties on outer space? The United States is party to four international agreements formulated by COPUOS that may affect the operations of a private Earth resources remote sensing system. Since 1979, COPUOS has worked on a set of principles to govern remote sensing by satellite. It is unlikely that consensus will be reached in the near future. However, decisions reached in the United Nations could have a significant negative effect on the operator of a U.S. remote sensing system.

The fifth and final question, Mr. Chairman, would be: What role would the private firm have in international negotiations and agreements? For the market to develop, international standards would have to be developed and promulgated.

The United States currently participates in the deliberations of two international organizations that are constituted to coordinate standards for land-remote sensing systems. If a transfer of a satellite system to a private ownership eventually takes place, it will be essential to work out how private firms would interact with the U.S. agencies that have cognizance over these matters.

With respect to the national security implications, Mr. Chairman, in addition to the international and foreign policy issues, the transfer of remote sensing technology to the private sector does raise questions about the relationship a civilian remote sensing system has to the military and intelligence communities. By what regulations related to the national security would the private owner and operator have to abide?

Currently, the Government controls the spatial resolution, the spectral resolution and central wavelength, the geographic coverage of the satellite and the speed and timeliness of data delivery. Who would review the operator's plans for hardware and for data processing procedures?

More importantly, what procedures would be instituted and what arrangements would there be for appeal of such decisions? In OTA's view, it will be difficult to resolve these international and national security questions in such a way as to preserve the feasibility of a truly commercial enterprise.

Finally, Mr. Chairman, a word on foreign competition. Building directly on knowledge gained from U.S. experience, several other countries now plan land or possibly ocean remote sensing systems. In addition to the French SPOT system, which will be primarily used for land remote sensing, Japan, India, Canada, and the European Space Agency all plan to launch remote sensing satellites before the end of this decade. Although each system will undergo a significant testing period, all of these foreign systems are being designed to be operational rather than research and development systems.

Other countries see the development of the full range of remote sensing satellites as an integral part of their entry into space. In addition to constructing systems competitive with the U.S. Landsat system, they are moving ahead to develop systems that will also sense oceans and coastal waters.

With regard to these developments, a final question needs to be asked: As foreign remote sensing systems come on line, will Federal agencies be allowed to purchase the data that we need from them? Data products from several foreign systems under development have been designed to complement U.S. data. In addition, if there is no U.S. system, foreign systems may be the only source of timely multispectral and radar data.

Six years ago, in a National Academy of Sciences report, Harlan Cleveland wrote: "The world is waiting for some clear indication from the United States that the system is to be a permanent part of the Government's business." I think it fair to say that the industrialized, space-capable nations wait no longer. They are planning to take care of their own and apparently also the world's needs.

The usefulness of remotely sensed data from space for a wide variety of public and private purposes has been proven by the world's experience with the Landsat system, but its market value has not been determined. Although we believe the potential is strong for a viable commercial market for such data to develop in the 1990's, most analysts agree that rapid transfer of an Earth resources remote sensing system to the private sector at this point would be premature.

The question Congress and the Nation must face is, do the data that such systems generate have sufficient combined economic, political, and social value to justify continued Government involvement in an operational system? If the answer to the question is yes, then it should move with dispatch both to commit to data continuity of moderate resolution through the 1980's, as well as to resolve the thorny questions of private ownership and operation of Earth resources remote systems.

If the answer is no, then the United States should anticipate having to purchase its Earth resources data products from the French, or perhaps from other foreign sources.

Mr. Chairman, that finishes my summary of my remarks.

[The prepared statement of Mr. Gibbons follows:]

Statement of Dr. John H. Gibbons
Director
Office of Technology Assessment
to the
Subcommittee on Space Science and Applications
and the
Subcommittee on Natural Resources,
Agricultural Research and Environment
of the Committee on Science and Technology
U.S. House of Representatives
June 21, 1983

LANDSAT AND LAND REMOTE SENSING POLICY

My testimony is based in part on the findings of Civilian Space Policy and Applications, an OTA report released one year ago, and on a technical memorandum, UNISPACE '82: A Context for International Cooperation and Competition, released in March by this Committee. OTA is now engaged in a broad, independent assessment of the state of international cooperation and competition in civilian space activities, requested by this Committee and the Joint Economic Committee. This testimony reflects our findings to date.

My testimony consists of three parts. First, I will briefly summarize the current state of land remote sensing policy and explore the issues associated with private ownership and operation. Second, because U.S. foreign policy and international relations are central to discussions of satellite

remote sensing, I will discuss the issues that transfer of remote sensing to the private sector would raise in these areas. Finally, I will comment on the nature and state of foreign competition in earth resources remote sensing.

The Status of Land Remote Sensing

The Landsat land remote sensing system, the basic elements of which were conceived and designed in the days of Apollo, has demonstrated the utility of space-based land remote sensing for a wide variety of research as well as resource exploitation and management purposes. The technology has been proven and is ready for operational status. It has attracted a small but growing number of customers, within U.S. and foreign government agencies and in the private sector. While some of the applications of land remote sensing can be carried out on an ad hoc basis, most customers require time series data on a continuous basis and assurances that comparable data will continue to be available.

At this point the following questions need to be answered: 1) Should the United States continue an operational civilian land remote sensing program? 2) If so, what form should it take and what will be the economic, social and political costs? 3) If not, what will be the costs of not doing so? 4) What international and foreign policy implications follow from any proposed course of action?

These questions have been with us for several years, yet while the United States continues to deliberate, the French are building a subsidized, but private commercial system. The French

SPOT remote sensing satellite, scheduled to be launched in January, 1985, will be simpler, cheaper, and in certain respects more capable than the Landsat satellite. At least six other countries are also planning operational remote sensing systems.

At the present time, the Congress is faced with an Administration decision to transfer the Landsat system to the private sector, "as soon as possible." OTA believes the implications of that decision have not been adequately considered. Most of my testimony will be devoted to exploring these implications.

Four major options for treating earth resources remote sensing are open to the Federal Government: 1) The Government could continue to operate a civilian land remote sensing system for the public good. 2) It could seek to establish and participate in a multinational consortium to own and operate a land remote sensing system. 3) It could see the system transferred to the private sector. 4) It could decide to withdraw completely from an operational civilian land remote sensing program after Landsat D' and continue to do only research and development. ~~D' Prime~~

One additional option sometimes mentioned is that of simply using suitably degraded data taken from classified satellites. However because the civilian and military intelligence satellites serve entirely different purposes and produce different kinds of data, this option is not feasible for most civilian applications.

Of the above courses of action, only that of withdrawing completely from providing operational services would appreciably

D-prime

reduce future Federal budget outlays for remote sensing. Successfully transfering the Landsat system to the private sector would involve substantial subsidies for an extended period because the Landsat satellites are not optimal designs for commercial use and because the total market for land remote sensing data is currently very small. Although several analysts predict that with proper encouragement, the use of satellite data will expand and grow into a major business, uncertain Government policy has inhibited potential customers here and abroad from investing in the analytic equipment and personnel they need to use earth resources data most effectively. Some analysts believe this has inhibited the development of a genuine market for the data. How large the market could be if data continuity were assured no one presently knows. However, if the Government were to guarantee the availability of timely, moderate resolution multispectral data for a 5 to 10 year period and at a reasonable price, it should become apparent over that time whether the market would grow large enough to support a commercial operation.

Policy Options

Continued Government Ownership

If providing remote data sensed by satellite is considered sufficiently important to the Nation's foreign policy, national security, research, and leadership objectives, the Government could continue to own the system. In spite of the current resolve to transfer the responsibility for providing for U.S. satellite remote sensing data to the private sector, there is

still a plausible case to be made for retaining responsibility for a system in the Government on the grounds that it provides a worthy public good and that the government, itself, remains the single largest customer.

Multinational Consortium

Another option is to establish a satellite remote sensing system owned and operated by a multinational consortium. Under this arrangement, a single multinational management authority would assume responsibility for global operation of a system, including establishing technical specifications, procuring and operating satellites, and receiving and preprocessing data. Although satellite remote sensing is likely to be of most ultimate utility to the developing nations, with the current climate in the U.N. towards remote sensing, a U.N.-organized consortium is not likely to work. It would in principle be more feasible to establish a limited consortium among the nations interested in participating, similar in form to the INTELSAT structure; however, the commitment of the French and several other countries to national systems might now make it quite difficult to reach agreement on such a consortium.

Options for Prompting Transfer to the Private Sector

The eventual goal of the transfer of any Government R&D to the private sector is to contribute to a self-sustaining business. Among the many possible variations, let me mention three: **Government contract** with one or more private firms, either

to provide a direct subsidy or to purchase data at an agreed price that would enable sufficient support for continued operation and development; a **laissez-faire approach** with competitive bidding to supply data for Government needs; and a **mixed, phased strategy** that would allow private vendors to build a market over time while retaining partial Government ownership. Several factors need to be assessed for such transfer: the cost and performance of the satellite system, the size of the market, and the operator's ability to receive and process the high data flow from the satellite. Landsat, for example, was built as a research and development system. Its operations and maintenance costs are apparently too high to sustain a commercial enterprise.

Without a strong overall market for data and information products, no commercial operation is likely to be successful. The current U.S. market for Landsat data is about $10 million annually, compared to operations and maintenance costs of about $23 million for Fiscal Year 1983. In addition, the decision by the Administration not to guarantee data continuity through the 80s has inhibited the growth of the market. It is clear that the global market for primary data is not likely to grow large enough to support a non-subsidized commercial system, unless system costs can be markedly reduced and proper attention given to marketing data.

Successful commercialization of an earth resources system also depends highly upon advances in information technology that will make data manipulation, distribution, storage and retrieval

simpler and less expensive. This is because the products derived from satellite remote sensing bear a closer relationship to the information industry than to the space industry.

International Issues

Commercialization would also raise a variety of international issues which have not been adequately considered. Yet outer space is inherently an international realm, subject to international treaty and agreements between governments. Data products from the Landsat system as well as the two weather satellite systems have served as important instruments of U.S. foreign policy by allowing the United States to share its technological expertise and create goodwill for U.S. interests.

1) **What data policies would private owners be required to comply with?** For Landsat, the United States still follows the long-established non-discriminatory policy of supplying data in as timely a manner as possible to any nation that wishes to purchase them. This policy is an important reflection of our principles as an open society and was a significant factor in our ability to develop the Landsat system with little protest from the world community.

2) **What relationship would a private firm or firms have with the foreign Landsat receiving stations?** The foreign ground stations are all local government-owned and operated and receive data directly from the Landsat satellite by agreement with the U.S. Government. For a fee, these stations receive and preprocess these data and sell data products to their

customers. In turn, they agree to abide by the same non-discriminatory sales policy practiced by the United States--the data is available to all comers.

3) **How would a private company and the Government deal with the political and economic concerns of many developing countries?** Other countries are well aware that the possession of remotely sensed data and the ability to analyze them gives others power to affect their resource development. Private operation of the system may heighten suspicions that such data would be used to gain competitive advantage, or that data on crop conditions or military activities might be sold preferentially to political or economic adversaries. In addition, some countries object to the U.S. policy of open distribution of the data from Landsat. However, the United States has consistantly opposed efforts to limit the distribution of Landsat data on the premise that any regime which arbitrarily controls resource information is incompatible with the U.N. doctrine of the international free flow of information. The entire issue of prior consent to distribute data about a country was of deep concern at the UNISPACE '82 conference. It will continue to be a major issue in the U.N. Committee on the Peaceful Uses of Outer Space (COPUOS) and other international fora.

4) **What Federal oversight will be needed for the various international treaties on outer space?** The United States is party to four major international agreements formulated by COPUOS that may affect the operations of a private earth resources remote sensing system. Since 1979, COPUOS has worked on a set of

principles to govern remote sensing by satellite. It is unlikely that consensus will be reached in the near future. However, decisions reached in the United Nations could have a significant negative effect on the operator of a U.S. remote sensing system.

5) **What role would the private firm have in international negotiations and agreements?** For the market to develop, international standards will have to be developed. The United States currently participates in the deliberations of two international organizations constituted to coordinate standards for land remote sensing systems. If transfer of either satellite system to private ownership eventually takes place, it will be essential to work out how private firms would interact with the U.S. agencies having cognizance over these matters.

National Security Implications

In addition to the international and foreign policy issues, transfer of remote sensing technology to the private sector raises questions about the relationship a civilian remote sensing system has to the military and intelligence communities: **By what regulations related to national security would the private owner and operator have to abide?** Currently, the Government controls the spatial resolution, spectral resolution and central wavelength, geographic coverage of the satellite, and the speed and timeliness of data delivery. Who would review the operator's plans for hardware and data processing procedures? More important, perhaps, what procedures would be instituted, and what arrangements would there be for appeal of decisions?

In OTA's view, it will be difficult to resolve these international and national security questions in such a way as to preserve the feasibility of a commercial enterprise.

Foreign Competition

Building directly on knowledge gained from U.S. experience, several other countries now plan land and/or ocean remote sensing systems. In addition to the French SPOT system, which will be primarily used for land remote sensing, Japan, India, Canada, and the European Space Agency all plan to launch remote sensing satellites before the end of the decade. Although each system will undergo a significant testing period, all of these foreign systems are being designed as operational, rather than research and development systems.

Other countries see the development of the full range of remote sensing satellites as an integral part of their entry into space. In addition to constructing systems competitive with the U.S. Landsat system, they are moving ahead to develop systems that will sense the oceans and coastal waters. With regard to this development, one final question needs to be asked: **As foreign remote sensing systems come on line, will Federal agencies be permitted to purchase the data they need from them?** Data products from several foreign systems under development have been designed to complement U.S. data. In addition, if there is no U.S. system, foreign systems may be the only source of timely multispectral and radar data.

In Conclusion

Six years ago, in a National Academy of Sciences report, Harlan Cleveland wrote "the world is waiting for some clear indication from the United States that the system is to be a permanent part of the government's business." I think it fair to say that the industrialized, space-capable nations wait no longer. They are planning to take care of their own and apparently, the world's, needs.

The usefulness of remotely-sensed data from space for a wide variety of public and private purposes has been proved by the world's experience with the Landsat system, but its market value has not been determined. Although the potential is strong for a viable commercial market for such data to develop by the 1990s, most analysts agree that rapid transfer of an earth resources remote sensing system to the private sector is premature. The question that the Congress and the Nation must face is, do the data such systems generate have sufficient economic, political, and social value to justify continued Government involvement in an operational system?

If the answer to this question is yes, then it should move with dispatch and with confidence both to commit to data continuity of moderate resolution through the 80s, as well as resolve the thorny questions of private ownership and operation of earth resources remote sensing. If the answer is no, then the United States should anticipate having to purchase its earth resources data products from the French and other foreign sources.

Mr. VOLKMER. Thank you. Thank you very much. We want to thank you for your input and your assessment in terms of the need to look at not just the gain but the cost to the Nation of such transfer, social and political.

To date, our hearings have been inundated with data which seems to focus on revenue attention. However, I would like to ask you—I am sure there are sound reasons—why you chose not to include the Metsat transfer in your testimony?

Mr. GIBBONS. Mr. Chairman, we feel that the Metsats are in a distinctively different category from land remote sensing, and the question of the Metsats really raises a different set of issues.

Mr. VOLKMER. Thank you very much.

At this time, I will recognize the gentleman from New York, Mr. Scheuer, for any questions that he may have.

Mr. SCHEUER. Thank you, Mr. Chairman.

Mr. Gibbons, on page 4, you note if the Government were to guarantee multispectral data for 5 to 10 years, we then would have a pretty good clue as to whether the market would grow large enough to support a commercial operation.

Since we have had Landsat in operation for 11 years, why don't we know the answer to that now?

Mr. GIBBONS. It is true that we have had data for a number of years, and we found a number of users in Government and in the research sector. However, the users, until recently, have had access to this data at virtually no cost. If you provide information at no cost and then measure the number of users at no cost, that is not a very good indication of how many users you might have if they had to pay for it.

Now, it has only been a matter of, I believe, about 1½ years at this point that we have been making charges for Landsat data that begin to reflect some, but not all, of the full costs of that information.

If I may, Mr. Scheuer, I would invite Peter Sharfman to add to my response.

Mr. SHARFMAN. During the recent period when the charges have become more significant, the U.S. Government has had not been willing to guarantee continuity of data into the future. That has an artificially depressing effect on the market.

Mr. SCHEUER. How much would it cost Government, either one of you, to guarantee this multispectral data for the 5 to 10 years you are talking about?

Mr. SHARFMAN. To guarantee continuity of data over a 5-to-10-year period, we would have to commit to some system to follow on to Landsat D', which will not necessarily last for that full 10 years. If the follow-on is conceived not as a research and development satellite but as an operational satellite, it could probably be built at a lower cost than Landsat D or D', and that could keep the charges down. We have not worked out just what the cost of such a program would be over, say, a 10-year period.

Mr. SCHEUER. On pages 4 and 5, you say that since the responsibility for the system in Government can be justified on the ground that it provides a worthy public good, a plausible case can be made.

Looking at it from the other point of view, assuming that your system were to demonstrate the land remote sensing market, what

do you perceive to be the threats to our national security or foreign policy objectives, and the impact on our own domestic economy, if that condition were to prevail?

Mr. GIBBONS. It is a little difficult for me to be precise in my response, Mr. Scheuer, but I would say that, first of all, if the United States drops out and stops providing important information about the Earth, about how things are changing on the Earth, and about Earth resources, then it puts us in a different class from the French and others that will be providing those kinds of information. And America's strength over many, many years has in part derived from being the source of good information about resources, whether it be on the ground or not. So it puts us into a different category of the world's industrial nations just to start with.

I would be quite confident that if only the French would be operating the system, they would be willing to sell information to us. Since it is a system in France that is guaranteed some considerable support by the French Government, it is a little difficult to say what the price might be. It is also a little difficult for me to answer you this morning other than to raise the question about the impact on our ability to maintain ground stations which not only receive Landsat information but other kinds of information around the world.

Mr. SHARFMAN. Just to highlight a point, that answer applies to land remote sensing but not to meteorological data. If the United States stopped providing meteorological data altogether, the consequences would be much more severe.

Mr. SCHEUER. What would your view be of international user fees with regard to weather satellite data; that is, allowing a commercial entity to sell weather data internationally that had been currently disseminated without charge by us? What would the impact of the user fees be on the current system of open exchange of meteorological data? Would this have national security implications restricting the flow of data, for example, to the DOD?

Mr. GIBBONS. By long-established custom, meteorological data are exchanged among all nations that gather it without any payment or fees or charges whatsoever. We provide data from our satellite and, in return, we receive a lot of data from other countries that are essential to our own weather forecasting capabilities. And, for that reason, we would have grave reservations about moving that system which is working so well around the world—north, south, east and west—into a thing that involves user fees and user charges. We view it with a good deal of concern.

Mr. SCHEUER. Do you get any feeling from the Department of Defense that they have some queasy qualms or reservations about the letting of their control and having to sort of apply as a commercial user for information they are now getting on an assured basis?

Mr. SHARFMAN. Certainly they have qualms.

Mr. SCHEUER. Queasy qualms?

Mr. SHARFMAN. That is an inference one might draw from their reluctance to answer the question at all, even though it has been asked, and it is a relatively simple question.

Mr. SCHEUER. That is why I say it is more than qualms; it is queasy qualms.

Mr. SHARFMAN. OK.

It I may add one other point on the previous question, a case could be made that if meteorological data were sold rather than exchanged for free, we would be the net losers financially; in other words, we might end up paying more for those data that we receive and need from other countries than we would obtain by selling them data which we get from our satellites.

Mr. SCHEUER. That is an important point. Thank you very much.

Mr. VOLKMER. I now recognize the gentleman from New Mexico.

Mr. LUJAN. Dr. Gibbons, in my opening statement I made it a point to say that the administration did not make a decision to turn it over to the private sector, that the decision was to inquire as to whether that was a proper thing to do or not.

In your statement, on page 3, you say at the present the Congress is faced with an administration decision to transfer the Landsat system to the private sector as soon as possible.

Now, you did change that in your remarks and said a decision or proposal, indicating that you rather agree with what I said, that the decision has not been made by the administration to turn it over?

Mr. GIBBONS. That is correct.

Mr. LUJAN. Would you change your statement that is going to appear in the record as printed, your written——

Mr. GIBBONS. My written statement will show that impression. The full written statement is going to be completed only today, and I will certainly make certain that my oral statement is in agreement with the written statement.

Mr. LUJAN. Thank you.

OTA, the Office of Technology Assessment, I was not here when it was formed but the name would indicate that OTA would assess technology, is an arm of Congress that assesses the technology and then tells the Congress what the result is, what the implication might be of turning it over. Yet in your statement you simply ask the questions, which is where we are at, simply asking the question.

For example, on page 11 it says, do the data such systems generate have sufficient economic, political, and social value to justify continued Government involvement in the operational system? That is what we want to know. We know the question.

Have you given some thought to if those concerns justify continued Government ownership or if they don't? Can you give us the answers to them rather than the questions, is what I am getting at?

Mr. GIBBONS. It is a fair question. Our first attempt is to try to identify what the key questions are and then answer to the best of our ability those that we can. Sometimes we can identify key questions even if we can't answer them.

That is the case today. In other words, we haven't reached conclusions that we don't have before you here. It is extremely difficult, in trying to assess both the market and nonmarket value of remote sensing services to get quantitative answers and we have had limited time and resources to try to do so. I feel that our answer is insufficient primarily because the data at this point are insufficient, too, especially about the market opportunities.

Might I ask Peter if he would like to add to my response?

Mr. SHARFMAN. The written testimony will discuss the economic, political, and social value of such data, drawing upon the more complete discussion of that subject in the thick volume we published a year ago on civilian space policy and applications.

We are in the midst of looking at the implications of this for international competition and cooperation, and the written testimony will say what we know and still are learning. However, the question comes down ultimately to whether the taxpayers want to pay to do this, and they have elected you to make that decision. We try to provide data that will help you and you have to decide.

Mr. LUJAN. We formed OTA to give us the information on which to base that decision and that is what I was getting at, is that we need to know from you. For example, the operational costs are $23 million, according to your statement. The income is $10 million. We have heard that it is a constrained market, that is why it is only $10 million.

Certainly, the private sector is more adept at developing markets than the Federal Government. We need to know if in the opinion of OTA that market can be increased; that is, the U.S. market of $10 million? What about the international market. If everyone and his brother is going into the remote sensing business, they must feel that there is an international market for it and so, therefore, we take the $10 million which admittedly is constrained but not put in the international market, and perhaps then it does make it a viable alternative for commercialization.

I am not pumping for commercialization necessarily, although I think the mission of NASA is research and then to turn it on over. But it seems to me that the issue has not been explored by OTA. We know the questions. We depend on you for the answers. That is really what we want from OTA, at least this member does.

Mr. SHARFMAN. Well, this is of course a very complex question. In the first place, the $10 million figure does include foreign customers as well as domestic customers, but not foreign ground station fees or foreign sales from those foreign ground stations and that is a market that we will shortly be dividing with the French when their system becomes operational. And based on past experience it is not unreasonable to suppose that the French Government will give the Spot Image Co. the financial means to shave prices, if that is necessary, to get what they consider to be an appropriate share of the market. So you will have Spot shrinking the U.S. share of the market even as one could expect to have entrepreneurial efforts and assured continuity of data increasing the market.

It is clear to us that a new satellite designed for commercial purposes could have lower operating costs than this $23 million a year. It is not clear to us, at least not yet, how much lower these costs might be.

What we are saying is that we know enough to say, with some assurance, that at the present time a private venture into this business could not be self-sustaining economically. That is to say the costs of running it plus some repayment on investment still to be made in the future, even assuming everything done so far was turned over for free, would be greater than the revenues that could be expected, especially with the French in the market.

Mr. LUJAN. Would that not be a question for the private sector to answer? Is that a better gauge than the Department of Commerce or NASA or anybody telling us that, well, they cannot do it for this price? Wouldn't it be, we are going to hear from Fairchild today; if Fairchild says we can do it, would that be a substantial reason for believing that it can be done?

Mr. GIBBONS. I would presume it would be very important to hear from the private sector just as you mentioned. I think one would also want to listen very carefully about what the private sector would say concerning its needed guarantees from the Federal Government in terms of annual revenues, and my guess is that those needed revenues are going to just about equal the cost of running the system under Government ownership, and that non-Federal customers may provide for a profit margin. But that is only a guess.

Mr. LUJAN. Thank you.

Mr. VOLKMER. The gentleman from Virginia?

Mr. BATEMAN. Thank you, Mr. Chairman.

I apologize for having had to be out of the committee room for part of your testimony, Mr. Gibbons. I guess what is intriguing me most is the extent to which our discussion seems to be generalized as to whether you can or should commercialize and, if so, how? And it focuses as much on operations and the implementation of programs whereas that which I have heard very frequently is the root of the problem: the government is not good at marketing things. Orthodox wisdom says that is correct, yet I have heard very little focus made on any plan, program, or concept to perhaps charge someone in the private sector with developing a marketing plan to be approved and then implemented, and then the Government and the Congress authorizes the kind of program that would be structured to deliver the kind of information that would equate best with a successful marketing plan once adopted.

Does that give you enough to give me some reactions to that thought?

Mr. GIBBONS. In part of my testimony this morning I mentioned several approaches to transfer this function to the private sector. I labeled one a laissez-faire approach, with competitive bidding to supply data for Government needs. I also mentioned a mixed or phased strategy which would allow private vendors to come into this as their own marketing sense tells them it is time to come in. Of course, that decision would be intimately related to Federal Government policy, because the Federal Government itself accounts for 80 percent of the total global market at this point.

I think it will be very illuminating to hear the commentaries from potential private sector venturers about what they would propose based on present knowledge, present experience, what they would anticipate the market to be, especially the market as influenced by two new factors. One is the cost-related pricing system, and the second is the market as opened up by the assurance of continuity of data over an extended period of time. Data time series have not been reliably assured before and that has been one of the main constraints to the market.

So I agree with you, I think it is time for extensive dialog with those in the private sector if any, who seriously feel that the time

is at least approaching for them to begin to bring that kind of marketing power into the system.

Mr. BATEMAN. Well, the thought that runs through my mind is that with the Landsat we frequently hear that there is not presently a sufficient user community to justify its being commercialized. And that there are two reasons for that: One, that there hasn't been sufficient assurance of continuity in program and data to make it attractive to the private sector as users; second, that there is a deficiency in a marketing effort.

Well, I suspect that the two are very definitely interrelated. I guess my concern is if all of this is logical, why we don't start talking about getting someone to make proposals for the marketing of a Landsat data which obviously would require some input into what kind of a system would be operated, what kind of data would routinely be made available, if the marketing plan were then approved and implemented?

Mr. GIBBONS. OTA has had extensive conversations with people about the potential market for these kinds of data. We have looked at the market as a function of resolution, cost, application, assurance of time continuity and the like, and I must say that I think the answers aren't so clear that if I were an entrepreneur I would say, "Boy, it is time to go."

There is however a fair amount of information that we have gathered, and I think it is important to be bringing it together. That is one thing we hope to do with our current study, and Dr. Sharfman may want to add to that.

Mr. SHARFMAN. Yes. I think one way of interpreting the sort of mixed strategy that we referred to as a third option, in the terms that you just mentioned, is that the Government would take on the responsibility for providing the continuity of data. This would mean, among other things, that if the market grew more slowly than anticipated the taxpayers would keep the system functioning while private enterprise would take on the job of trying to expand the market and of figuring out new ways of using the data.

That requires a prior decision by the Government, which logically should be expressed in the form of legislation, that there is a national interest in our staying in this business and providing the continuity of the data. In other words, that the Government is prepared to take what steps are necessary to make sure that that national interest is carried out, and that then the Government would seek private involvement to carry out entrepreneurial functions which are less appropriate for the Government to do and which the Government may do less well.

It is a question really of the logical order of deciding the issues. Our judgment is that if you start by saying you want private involvement, you are unlikely to get adequate assurance of continuity of data, of continuity of staying in the business. Without that assurance it is unlikely that the market can grow very well.

Mr. BATEMAN. Thank you, Mr. Chairman.

Mr. GIBBONS. I think a private/public partnership is implied at this time.

Mr. VOLKMER. I would like to interject at this time on that, that the question is whether we are not putting ourselves in a position where we may not be in a position to give that continuity because

of the prime, the Landsat, the last one. We have nothing in the works to go forward with, and if for some reason we do not receive an RFP to continue in operation, we will have a hiatus time, will we not?

If the Congress doesn't approve a commercialization or if the private sector don't come forward, we end up without anything, and maybe in 1987 or 1988——

Mr. SHARFMAN. We would, unless Congress directs the executive to design and procure some new system, paying for it out of the general revenues.

Mr. VOLKMER. The gentleman from New Jersey, Mr. Torricelli?

Mr. TORRICELLI. Thank you, Mr. Chairman. Mr. Chairman, I am sorry that among the witnesses here today it was not possible to have my grandfather, who would have sat here and listened to all this and would have said: "If it isn't broken don't fix it." That is the one comment that comes to me the most in hearing of this discussion, these last few months; of hearing testimony today. We lose sight of the fact that our space program, generally whether satellite program, specifically, has been an enormous national success to date. It may have problems, it may have some troubles, there may be questions of its direction from here, but for all of the flurry of activity one would think we are trying to rescue something in severe trouble. Severe, for someone from my perspective, anyway; it is at best confusing.

Let me ask, if I could, is it possible that you could give an assessment of what you would see the total Government investment to date having been in both satellites, Landsat and weather satellites? In what numbers do you feel some confidence? This is both the research and development and operation to date.

Mr. SHARFMAN. May we ask Dr. Gordon Law of the OTA staff to respond to that, please?

Mr. VOLKMER. Would you identify yourself?

Mr. LAW. Gordon Law, OTA.

In excess of $2 billion.

Mr. TORRICELLI. In excess of $2 billion. I have heard discussions that people might expect if there were and offer to buy the combined systems it would be in the neighborhood of $350 million. I can't cite the source of that, but I had that said to me informally.

Can you confirm that that is what is now being estimated might be a private offer, if there were a private offer?

Mr. LAW. Those are the figures that have been suggested but I don't know whether a firm offer was ever made.

Mr. TORRICELLI. I understand there hasn't been a firm offer. This is in fact perhaps the fire sale of all time.

Mr. LAW. I think, Mr. Congressman, that was $350 million a year, till such time as the private sector flew their own spacecraft.

Mr. TORRICELLI. $350 million a year until the taxpayers could be assured the total of $2 billion investment was recovered? That was not my understanding.

Mr. LAW. Or that the private sector had arrived to a point where they had a commercially viable system where they don't need effectively a Government subsidy in that amount.

Mr. TORRICELLI. I see.

Mr. GIBBONS. I might add, though, I believe the costs include the research and development cost.

Mr. TORRICELLI. $2 billion?

Mr. GIBBONS. Yes, sir.

Mr. TORRICELLI. I understand that.

I guess that is part of my question, the philosophy, part of what the Congress is going to have to answer, whether or not we have a problem with the sale that does not recover those research and development costs. Those costs were incurred by the taxpayers making an investment for this country. That now apparently might be sold without any attempt to recover them whatsoever.

Let me ask further. I have the fear here that this entire concept might be an invitation to create an enormous regulatory maze. Listening to your discussion of the consideration here both for defense, international obligations, access costs, and planning—I guess I am giving you more an impression than a question—but it appears to me that whatever costs we are now incurring, could be easily met by trying to control the private enterprise that we are allowing to be created. Each of those areas I take it seems appropriate for regulating—international obligations, relations to the nation's defense and other public entities, control over the planning to insure this Nation is going to stay in the business, and costs.

Are they all appropriate for this regulatory maze now that we may be inviting——

Mr. SHARFMAN. Yes, sir, and moreover there is the further difficulty that most of the rest of the world finds it very difficult to deal with a private company on such matters. Consequently, there would have to be a continual process of interface with the State Department.

Mr. TORRICELLI. To control information on behalf of others as well?

Mr. SHARFMAN. Yes, sir.

Mr. TORRICELLI. One of the things that concerns me is that this country must maintain a certain posture in science and in space irregardless of cost, in some instances, for purposes of our national security.

Here, by inviting a private operation, what means do you see or have you seen discussed that could guarantee continuing private investment to know that our technology in this field is the latest and that we are ever expanding?

Mr. GIBBONS. I would presume that what we are speaking of is the feasibility and the timing of transfer, not of research and development, but of the operation of a technology by the private sector or involving the private sector in some form. But it seems to me that is a separate question from the continuing role and responsibility of Government to take the lead in advanced research in the Nation's interest.

Mr. TORRICELLI. You still have the confidence that those would—can operate independently, taking away the institutional base and the current operations, and the knowledge that that provides to the Government, experience, the incentive and so forth, we can still have as successful a program for research and development in adding on and improving the system in the future? You have that confidence?

Mr. GIBBONS. It may be blind confidence but I do believe that while one needs a link with operations and research, that if one doesn't provide for separate identification of these activities, they can get mixed up with each other. I believe that NASA was formed to be primarily a research and development rather than an operational agency. That is part of the dilemma now faced with the operation of Landsat.

Certainly strong feedback needs to come from the experience of use back to the laboratory that advanced the relevant state of knowledge, however.

Mr. TORRICELLI. I am also struck that there may be more public relations in creating a private operation here than fact. What we really would be doing, we would have a commercial ownership. On the other hand, there would be a guaranteed long range use by the Federal Government, at some guaranteed cost, as a subsidy for operation. We would have control over the information the private company had because of obligations to foreign governments. We would probably have some arrangement about maintaining and improving the system for reasons of national security. And since it is probably going to be a monopoly we would have to be able to control cost. In fact, all we would really be doing is creating a private shell for public obligations.

It seems to me the public infringement would be necessary in so many areas that in fact we are doing no more than creating the shell, presumably for public relations purposes, even though it would really end up being public.

Could you comment on that?

Mr. GIBBONS. Well, certainly the Government itself is a major customer. At the same time, the opportunity for nongovernmental use and even the future of governmental use depends a lot on how imaginatively one can utilize the information, and on the cost of the system.

Now, the rationale for private sector involvement could start at the data end; that is, the downlink, from the ground. If assurance of data continuity over a number of years is given and if the frequencies and resolutions are right, then one of the most natural entry points for a private sector entrepreneur is to take those slightly processed data and turn them into useful information for customers. To some extent this has happened today.

A second level of involvement would in fact be to get the private sector more onboard with the satellite itself, which is under discussion today.

Mr. TORRICELLI. I think that is a good analysis. I share those thoughts. There is not really any conflict with the concept, that really is a shell, a tremendous public shield on a small private entry.

In fact, if we went ahead, let me conclude then with asking you the most obvious question and where I started, if it isn't broken don't fix it. What is the problem? Why it is nice that we are all in favor of a free enterprise and expanding free enterprise, we have enormous new priorities now that should be met. What is the problem here that has to be fixed, that is of such urgency we should have this dramatic change?

Mr. SHARFMAN. Again, to start, to emphasize the difference between land-remote sensing and meteorological satellites, because in the meteorological area we aren't aware of any problem. In land-remote sensing, the problem is that the Government has not been willing to guarantee continuity of data on to the end of the 1980's, has not been willing to spend the money to get into the pipeline a follow-on to Landsat D' which would be necessary to provide that continuity of data, but we see foreign countries getting into the business.

Mr. TORRICELLI. I understand that.

Mr. SHARFMAN. On a competitive basis.

Mr. TORRICELLI. That is the least likely where we see a private market in any case, if I understand your testimony correctly.

Mr. SHARFMAN. The question is what is the problem. The problem is if matters follow their present course, with no change, then in another 10 years the U.S. Government will be out of the business and buying civilian data from the French and perhaps the Japanese, Indians, Canadians, et cetera.

Mr. TORRICELLI. I thought in response to when I asked about staying current and moving ahead technologically, and how we were going to ensure that, you were careful to point out that we were talking about operations, not moving forward. So when I asked what is the problem, the problem you are presenting me with is one that in any case is going to reside publicly because you are not seeing that the private industry is going to address the problem that you are now presenting here.

Mr. SHARFMAN. What we are suggesting is that solving the problem is going to require some substantial amount of Federal expenditures. This could be Federal expenditures to keep moving with a federally owned and operated operational system. The Federal research and development will continue in any case. NASA is not going out of business. A lot of this technology is developed for military and intelligence purposes, and will be developed for that purpose. The technological base is not going to disappear.

But to provide an operational system, which makes data available for civilian use, either the Federal Government has to decide that it is going to stay in this business, and fund it, and move toward procuring the necessary operational satellites as successors to Landsat D'; or else the Federal Government has to find some way of getting somebody in the private sector to do that, and we are saying that we doubt that private ownership can work without a substantial Federal involvement.

Mr. TORRICELLI. To conclude that analysis then, in fact, the problem on the current operations, when I said what are we fixing, there is not with current technology a problem, with operations we are fixing a problem that doesn't exist. The problem with the future expansion, operation, new technology, where we go from here, my conclusion would be in any case there is not going to be a private role because there is not an opportunity here for business, it is going to require another generation of government investment and development?

Mr. SHARFMAN. The problem is immediate because without the assurance that we will continue into the future we will lose our

customers to people such as the French who are prepared to provide that assurance.

Mr. TORRICELLI. I understand. Thank you.

Mr. VOLKMER. The gentleman from Florida, Mr. MacKay.

Mr. MACKAY. I would like to pursue that line of questioning, if I might, because it seems to me that gets a good perspective on what OTA is all about and the kinds of advice that you could give us. Now, I think your work created to give us a proper frame of reference, a proper way of looking at this kind of decision, policy advice, seems to me the problem is that there is a legitimate criticism of Government operating this kind of program because Government has no incentive at all and may be a disincentive to get out and try to broaden the market, so the problem is it is in our interest. I think Comsat showed it is in our interest to get this kind of thing into the private sector, or to figure a partnership way so there is somebody there trying to get out and create a market, and what I hear you saying is, Metsat is an example of where Government should not get out, Comsat is an example where Government got out appropriately, and this one is somewhere in between, but our failure to make a decision is what is killing us, and you make reference to 6 years ago some National Academy of Science report said the world is waiting on Government, on the United States to make a decision on this issue and you are now saying the world is not waiting, they have already left.

My question I think based on all of that is, Are you not on page 11 of your report saying in fact, although you phrased it in terms of questions, are you not saying in fact we should commit ourselves to continuity regardless? In other words, that there are really two decisions. We should say, the U.S. Government is committed to providing this data on a continuous basis and we are staying in it, and that if we do commercialize it will be commercialization in the sense that we might contract with the private sector operator to operate it, and to try to expand a market for it, but in any event we are committed to whatever subsidization it takes to continue expanding the research base. I think that is what you are saying on page 11.

I think you are saying that the other nations, industrialized space capable nations have already made that decision and that was an appropriate decision, and that we should make it also.

Mr. GIBBONS. I think that is a very good reflection. The continuity of information, whether supplied by a Government satellite or by private sector satellite, it is absolutely critical to the usefulness of this technology. Without it, nothing is going to work, and people will buy from the French. With it, there is a question of exactly how many people, Government and non-Government will make use of it, and in what way? However, one can start with the assumption, for which I believe the evidence is strong, that it is justifiable to provide on a continuing basis this kind of information, that there are markets, there are needs, there are opportunities. The question before you is how does one do that? In what way does one bring in the power of a private market system into this as hopefully the use of this expands into the market sector?

Mr. MACKAY. Would not the appropriate question for us to be asking you be to give us a frame of reference or a way to look at

this issue, not only with Landsat and Metsat, but to give us a frame of reference so we can better determine in each of these cases, civilian use of space-related research, so we could better determine when partnership or hybrid or complete sale of these into the private sector would be appropriate? Do we have now a better benchmark?

I know that in the case of our space program, the Ariane program is now competing vigorously with us, and we can't really afford to be continually kind of wandering in the wilderness of taking these things on an ad hoc basis. The uncertainty is what is going to make us uncompetitive.

Is that the kind of project that OTA, that you see would be appropriately within your realm or are you already doing this?

Mr. GIBBONS. Yes, sir, I think that is in fact part of the presently ongoing work we are doing on international competition and cooperation in civilian space and it seems to me that if we can't come forward with that kind of information for you, then we won't have done our job.

That study is scheduled for completion in October or so of this year, in this fall. And if you feel that it is imperative to have some more of that information prior to October, we would certainly try to provide that to you. But that is our present schedule for completion.

Mr. MACKAY. It seems to me that that is the issue that is posed by this whole Landsat thing, and it may be very valuable. We may have accidentally done a good thing by having a crisis here that causes us to have to look at the context. Obviously there are tremendous commercial use of Landsat data. The question of how you price the data will determine whether there is going to be a market.

In agriculture alone, if we could take the pictures that are available off of that satellite and map what is going on in Brazil and citrus we could know very well some facts that are needed to be known in Florida citrus and the industry would pay for that data. But my understanding is if you price it at full price, it is $2,250 per frame, which means it is not going to be available and we are going to continue shooting from the hip, and I gather on a large scale, that that is the kind of thing that is going to happen, as people try to decide what the Government is going to do, so nobody is willing to commit to anything.

The idea there is no market there is just unrealistic. there is an unlimited market there, once the Government decides what to do. I would think an appropriate study, Mr. Chairman, would be to ask OTA to try to define the parameters of this kind of decision. To me an appropriate policy would be one that says we want a private sector contractor in there with us trying to expand this market as rapidly as possible, and we want to know the decisions we can make that would enable the market to expand, and right now the way this issue is posed, well, we have decided to put it out for bids, and us saying, no you are not going to put it out for bid, it makes for great press but in fact the real decisions that need to be made are not even being addressed in this format.

I would like your comment on that. I didn't mean that to be an editorial.

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Mr. GIBBONS. Well, I personally share very strongly the thoughts you are expressing; namely, that this shouldn't be an isolated decision but should be in the context of the development of new ways of gathering information that are useful not only in the national interest but to private sector interests. Land remote sensing is also deeply involved in our international interests. The Brazilians are also interested in how much those same photographs would cost, maybe they are looking at Florida citrus just as we look at Brazilian citrus.

I would hope that this study we are in the midst of now will help provide that context. In fact, the words of this morning spur me onward to say that is what we must be doing.

Mr. MACKAY. Thank you.

I guess the only other comment I would make is I would hope this committee, subcommittee, would go forward with the idea not only of trying to decide what ought to be done in this situation but of trying to help formulate a policy or some guidelines so people not only in the Congress but in the rest of the world could determine how we are likely to react as this question comes up over and over again.

Mr. VOLKMER. Thank you.

The gentleman from Florida, Mr. Lewis.

Mr. LEWIS. Thank you, Mr. Chairman.

And I do apologize, Mr. Gibbons, for not having the opportunity of hearing all of your testimony, but I did read it.

In your testimony, you do discuss the basic elements of land remote sensing systems where conceived and designed in the Apollo days. Are you implying that there has been little change since then?

Mr. GIBBONS. No, sir, but there has been a long-time continuity of experimentation and development in this area. Obviously, our capabilities today far exceed the place we started from back in the Apollo days.

Mr. LEWIS. Do you feel that the United States should develop a subsidization with a private commercial system like the French did, who were successful the other day?

Mr. GIBBONS. If we expect to enter this arena with an operational land remote sensing satellite, it is going to have to take public subsidy for a while at least, just as it is in France.

Mr. LEWIS. How do you feel the atmosphere would be with the private sector accepting the Federal Government as a partner in something like this?

Mr. GIBBONS. I think the private sector would insist on it; otherwise they won't enter at this point.

Mr. LEWIS. Do you think that the private sector would be looking at the Federal Government to take a majority of the risk or share on a proportional amount?

Mr. GIBBONS. With the Federal Government being party to it, about 80 percent of the data in terms of data use currently, I would expect the private sector would see the Government as its primary customer. The private sector would want to develop other customers for that information, but they would be spending most of their time looking at the Federal Government simply because that is the market.

Mr. LEWIS. Does the $10 million annual market in the United States for Landsat data include commercial and Government customers?

Mr. GIBBONS. Yes; it does not include fees that we receive from the foreign countries on which we have the ground stations, but it includes I believe our Government and private sector customers. And the Government is about 80 percent of the total.

Mr. SHARFMAN. That is all levels of government, not just the Federal Government, Federal, State, and local.

Mr. LEWIS. What would you say that the foreign market for Landsat data would be; if we are at $10 million, what approximately would you give to the foreign market?

Mr. GIBBONS. I might ask Mr. Law if he could respond directly to you, Mr. Lewis.

Mr. LAW. The data currently available to OTA would indicate, Mr. Lewis, that the foreign purchase is about 10 percent of the total Landsat sales of the Eros Data Center in Sioux Falls. It is difficult to get a handle on sales from foreign ground stations because what we receive is effectively a royalty for each product sold, whether the host country sells the product or not. They could give the data away on a quid pro quo arrangement for other favors offered or given. We have no idea what the real dollar figure is.

Mr. LEWIS. Why would the open skies data policy be a problem to the private firms that would be involved in these systems?

Mr. LAW. I would think that the private sector would insist on maintaining the open skies policy because that has been a major source of the strength of the systems over the years within the United Nations and other international fora.

Mr. LEWIS. You feel there won't be a problem with privileged data, for example, if the private sector would put up a satellite, and collecting RF signals from the satellite, for specific reasons that they would want to keep it confidential and away from another competitor?

Mr. LAW. I think that that is obviously a concern and it is a concern that permeated the Unispace deliberations in Vienna. I think it also links to many other issues, the International Telecommunication Union/Direct Broadcast Satellite issue, sovereign rights issue, the right to equity against first come, first serve.

I think one of the problems that you fall into in addressing these sorts of issues is that we tend to look at them as singular standalone issues when they are really in an international context linked to many other things going on in space. It may well be, if the private sector were to take over, that groups like the Group of 77 would come back to the United States within the international fora, where one man, one vote prevails, and where we don't do very well, and raise the whole idea of sovereign rights and of prior consent to the right to sell sensitive data of a country to a third country. It gives those countries that are not too friendly to us at the moment another reason to be less friendly.

Mr. SHARFMAN. May I elaborate on that a little bit? In theory, a private firm managing a land remote sensing satellite might have two sorts of incentives to depart from a pure open skies policy. One would be that some customer might pay more for data on an exclusive basis or an advanced basis. The second is that if it is a large

company that is in many businesses, another division of the same company might want to get privileged access to the data before it was open for general sale.

However, there would be strong reasons for the U.S. Government to forbid a private company from adopting any such policy. These would be international reasons. If the rest of the world had evidence that some U.S. customers were obtaining commercial advantages from preferential acccess to the data, there would be all manner of pressures in international forums to cut off our right to sense other countries and sell the data.

While they couldn't physically stop us, they could, as Dr. Law said, put pressure on us in areas such as international communications where we simply cannot communicate without international cooperation.

So it comes down to the question of the Brazilian citrus growers wanting to be absolutely sure that under no circumstances can the Floridians get preferential or advanced access to this data.

Mr. LEWIS. Thank you.

Mr. VOLKMER. Thank you. Dr. Gibbons, earlier we talked a little bit about the Metsat, and I know from the questions and statements you have seen here that the committee has quite a bit of interest too, and I would appreciate it if you could provide us in writing the variables or differences that you see through the idea of commercialization of Metsat.

Mr. GIBBONS. I will be pleased to submit for the record an expanded answer to your questions.

[The information follows:]

Answers to the additional questions for the record
June 21, 1983

Question 1. If land sensing systems are to be continued, what specific steps must be taken? When?

As noted in OTA's testimony, the first issue to resolve in land remote sensing by satellite is whether the Government is sufficiently interested in the products available from the satellite systems to guarantee data continuity for a reasonable period of time (5-10 years). Following that decision, which has obvious implications for the Federal budget, it could follow one of several courses in order to continue the system:

1) The Federal Government could continue to own and operate the satellite systems for the public good. This would mean completing and launching Landsat D' as soon as possible, in order to replace the failing Landsat 4. It also means starting work within a year on a follow-on system to replace D' when it fails (around 1987). At a minimum, the follow-on should have sensors capable of producing data comparable to that provided by the multispectral scanner aboard Landsat 4. These data constitute the baseline requirements for most Federal agencies and for many foreign and domestic customers of satellite data. Special processing and data interpretation for various clients would presumably continue to be done by private entrepreneurs.

2) The Government could contract out the operation and marketing aspects to the private sector, but retain ownership and responsibility for the entire system. The Government would still have to buy follow-on satellites, but the private operator would be left free to develop the market.

3) In a cooperative, phased approach, the Government could continue to own, operate and replace the space components of the system and transfer the ground-side data processing and marketing activities to the private sector. OTA estimates that it would take 5-10 years of such an operation to prove out the possibilities of developing a sufficient market to attract private sector operators of a complete system to enter the field on a competitive basis.

4) Finally, the Government could attempt to turn the entire system over to the private sector as soon as possible by offering to subsidize such a system either directly, or indirectly (e.g. by guaranteeing to purchase a substantial amount of data). Of all our options, this is the only that would require no follow-on satellite provided by the Government. The operating company would then be free to design and build its own follow-on satellite. Before this option could be carried out, the Government would have to take steps to ensure that that the requirements of a) international trade and foreign policy, b) conformity with the international legal regime, c) Government agencies for data, and d) national security, in addition to future technical requirements, are all met.

Question 2. What would be some of the specific costs to the U.S. if it were not to operate a land remote sensing system?

This is a question that we are addressing in as much detail as possible for our assessment of "International Cooperation and Competition in Civilian Space Activities." Some of the costs would involve substituting other generally more expensive methods (e.g. surface observations and aircraft surveillance) for what is currently done now comparatively inexpensively with Landsat data. Other costs, related to loss of technological leadership in remote sensing, loss of an effective diplomatic tool, or a decreased

scientific capability, are qualitative and are therefore impossible to pin down with any assurance. This applies as well to the losses that would accrue to U.S. trade and prestige if the United States were obliged to purchase remote sensing data from one or more foreign sources. We simply do not know how to place a precise dollar figure on the social and political benefits that we derive from the current system, yet these benefits may well be considered to be the most important part of the Landsat program.

Projections of the potential future value of these data and the costs of not continuing to operate the system are hampered by the fact that potential customers have not gained enough experience with them to assess what their long-term value might be. The extraordinary value of one-time views of unchanging scenes, such as goelogical features, is well-established. But there are a number of other valuable applications which have to do with the way conditions change with time (e.g., agriculture, forestry, pollution control); those therefore require periodic time - series information from a given region. Without having data supplied on a continuous, timely basis it will not even be possible to assess whether a substantial market for earth remote sensing data could evolve in the future.

Question 3. The French originally proposed a "Multinational Consortium" for remote sensing. Now it seems you are saying that they might oppose such an arrangement. Please explain.

The French decided several years ago to enter the remote sensing field with an operational, commercial satellite. The French company, SPOT Image, is now well on its way to establishing an international marketing organization to sell SPOT data when they become available in 1985 or so. Especially with the long-term uncertainty in the United States over land remote sensing systems,

the French now seem unlikely to give up a potential political and economic competitive advantage by entering a multilateral consortium. On the other hand, if the French system proves to be an effective tool, and they have a U.S. system to compete with, they might be interested in cooperating in order to share costs. OTA explored the parameters a multinational system might have in its Civilian Space Policy and Applications assessment (June 1982) and concluded that such a system was not only feasible, but might solve some of the thorny issues that are now raised in the process of studying commercialization.

QUESTION 4. Assume land remote sensing is commercialized and one company is the operator (e.g., a de facto monopoly thropugh a guaranteed data purchase). a) Should such a company be barred from engaging in value-added activities? b) Should such a company be regulated similar to the way that common carriers are regulated?

a) Because withholding certain data for a day or two could seriously adversely affect a competitor's ability to produce a high value product, and because other countries might entertain suspicions that the monopoly firm was using the data to gain economic advantage over them, there would be strong reasons to bar the operator from value-added activities.

b) Some form of regulation is likely to be appropriate, but the precise form of that regulation depends on judgements about what requirements should be imposed on the operator in order to protect the public interest. We are working on an assessment of various possible requirements and will be able to provide further guidance when our assessment is delivered to Congress in Fall

1983. It appears unlikely to OTA that common carrier regulation will prove to be the most appropriate model.

QUESTION 5. At present we have "free exchange" of data from Metsats and "open skies" for Landsat. And we charge for Landsat data, but the price and availability of data are the same for all customers. A future commercial operator well might want to combine land and weather sensors on the same spacecraft. a) Could this lead to confusion as to whether "free exchange" or "open skies" policy would prevail? b) What are the international implications?

a) At present the two systems operate quite differently. The polar-orbiting Metsats effectively cover the Earth's surface in twelve hours; Landsat 4 takes sixteen days. Though both are polar orbiters, they operate at different altitudes. If the amount of data gathered by landsat in a 16-day period were compressed into 12 hours, the volume of the data would be unmanageable. Geostationary satellites are incompatible with current Landsat coverage--they have fixed positions with respect to the earth's surface, and because of the "look" angle, they are unable to gather useful data above 50° north or below 50° south latitude. In addition there would exist no continuity between such hybrid systems and the Landsat and Metsat archives. Historical comparisons would therefore be very difficult.

Still, the possibility of new sensor systems that would overcome some of these difficulties merits consideration. For certain specified data needs, it might be feasible to use the same satellite bus for collecting meteorological and land remote sensing data. The kind of satellite on which the data are gathered is independent of the purpose they serve. If a combined data collection system were developed, there should be no problem from the international civilian community as long as the United States retained its current policies for distributing the two kinds of data.

Mr. VOLKMER. I would like to have that, and I will be forwarding you additional questions because of the time limits that we have now. I will hold the record open and would like to have those.

I do have some basic ones I would like to ask for your opinion because the first one I know is a policy decision that we in the Congress will have to make eventually, and I think I know your answer, but I would like to have it for the record.

Do you think it is important to the United States to have an operational civil space remote sensing capability?

Mr. GIBBONS. Yes, sir. I would want to say absolutely yes to that case and also again to say one has to think carefully about the difference between land remote sensing and meteorological sensing.

Mr. VOLKMER. Yes. In other words, we shouldn't go into the future with the idea that we are going to rely on other nations for the information that we would need.

Mr. GIBBONS. Correct.

Mr. VOLKMER. Do you have any idea what it would be as to cost, both economic or social, if we did rely on other countries?

Mr. GIBBONS. We would lose an entry into international body politic that we have gained over the past years in remote sensing, Mr. Chairman. We would lose, if we stepped out of this business, technical development at home and probably access to new sensor technology that is developed by others. We now have quid pro quo in the area. We would probably lose the ground station network or could lose the ground station collection system which provides our national security base line data for complementing our space program and other mission agency programs. So I think we have a number of things that would be lost in the process.

Mr. VOLKMER. In other words, quite costly.

Now, should we in the Congress have framework legislation to guide the commercialization process? I think that was part of the thing alluded to by the gentleman from Florida, Mr. MacKay, as to the policy decision advances.

Mr. SHARFMAN. With regard to Metsat's, we doubt that there is much to be gained by transferring Metsat's and, therefore, not much need for framework legislation.

With regard to the Landsat, since there are a number of different general public policy approaches that can be taken, and since all of them, we believe, would require expenditure of the taxpayers' money within the context of a congressional decision as to how the money should be spent, we do believe that framework legislation would be needed.

Mr. MACKAY. Mr. Chairman, excuse me for interrupting. I would like to follow up on that.

My understanding is that the persons making the case for the transfer into the private sector would make a further case that you should transfer the Metsat with the Landsat since there is a market there that could in effect subsidize the Landsat development, and their argument is that in fact there are all kinds of people who would be willing to pay for the commercial use of Metsat. So my only point is I think you have got to assume that the framework is needed for all of these.

I happen to agree with your conclusion that it doesn't make any sense at all. However, there is a point of view that says oh, no, in fact that could be used to subsidize this.

Mr. SHARFMAN. Well, the point I would make is that since the United States needs for national security purposes and for civilian purposes meteorological data from other countries, and since we would have to buy data from a commercial Metsat to exchange for this foreign data, it would still be a subsidy, and there still would have to be legislation that set whatever framework was required.

Mr. VOLKMER. I would like to continue that question on a little bit as to the framework of the legislation.

Have you pursued this to any extent as to basically what should be, what I call, framework legislation?

Mr. SHARFMAN. Well, we have identified several different options which might be pursued for doing this, and framework legislation, as I am using the phrase, would essentially decide which of these options or some other option would be pursued.

We have not conducted a study in any detail at all of the implications of each of these options and we are not really prepared to provide you with the information which you would presumably want to have before making such a decision.

To recapitulate what these options are, to make this clear, one possible option, of course, is pure Government ownership. Another option is that the Government should contract with a private firm to operate satellite systems which the Government owns with the idea that the private firm would show great entrepreneural talent in doing this.

Another possibility is some form of mixed system in which the Government would continue the responsibility for obtaining the data but a private firm would do much of the processing and much of the selling of the data.

Another possibility would be private ownership altogether, but with a Government guarantee to purchase enough data at a high enough cost so that the private firm could know that the enterprise would be viable for a significant period of years.

Mr. TORRICELLI. Mr. Chairman, I just wanted to have the record complete in a discussion we had earlier on the question of the $2 billion total cost of development of satellites compared to the outstanding discussion of a possible offer; in rechecking my notes, that offer as now discussed is $350 million for a $2 billion system.

Without passing judgment on it, although I continue to think it is a fire sale of all times; nevertheless, that is a $350 million total figure, there was some discussion that might have been an annual payment, downpayment, on the technology. My information is contradictory to that.

If there is something you would like to supply, I would like to see it in the record at the time the chairman keeps it open. But, as I understand, that is the best information.

Thank you.

Mr. LAW. I stand corrected.

[See attached clarification for the record:]

OTA inserted the following clarification of this point for the record:

In its informal proposal to the Government in 1982, Comsat suggested purchasing all Government Metsat and Landsat satellites and related equipment and facilities

for about $300 million. It further suggested that Government outlays, paid to Comsat, for Government data needs for the ten year period starting in 1983 would average $360 million a year.

Mr. VOLKMER. The gentleman from Pennsylvania.

Mr. WALKER. Yes. In looking through your testimony, Dr. Gibbons, I see no real effort that is indicated here with regard to figuring out just what the payoff of going to private systems might be.

For example, there are many people who believe that a transfer to the private sector would bring about the kind of swing toward profit that might produce all new uses for much of the data that is being obtained from these satellites, particularly in the case of Landsat, and I don't see anything in your testimony which indicates that that is the long-term benefit to the country, and perhaps even a short-term benefit, and I am wondering why, when we are discussing all the problems of moving in that direction, that OTA isn't just as cognizant of the kinds of scientific payoff that may come from a more aggressive attitude about how this data could be used.

Mr. GIBBONS. I would presume that that is the overwhelming implicit reason for thinking about private sector ownership. Certainly if the Government is, at least at this point and the foreseeable future, the primary customer, the overwhelming primary customer for the services, the hope from the private sector would be that one could obtain a system that is less expensive to operate, because industry knows how to whittle a pencil a little sharper in the competitive marketplace than Government does, and that entrepreneurialship in the private sector would in fact give us an operational system that has time continuity to it, and would result in the identification of additional customers both within and outside Government, both domestic and foreign. I can't disagree with you.

Mr. WALKER. There are some who are indicating that we simply want Government out of the problem and don't want the expense of operating the system for the Government anymore. There are some people who are saying the decision is a kind of simple matter.

On the other hand, I think that there sometimes does have to be the case made that there in fact could be some very good science and use of science made by people who have an interest beyond identifying those things of use to the Government. Up until now we have tended to look upon these things in terms of the data they collect that is of use to some Government agency. It might well be that much of that data is of use that far exceeds any kind of governmental thought at the present time.

Mr. GIBBONS. I would suspect that if there were a great open gold mine in that area that entrepreneurs would have already shown evidence of entering it by accessing the slightly processed data, carrying out further processing required to match needs of potential customers, and delivering it to them. The data are available to the private sector now to pick up and manipulate, synthesize and sell to someone with value added. That is not the question. The question is who owns the bird?

Mr. WALKER. In a sense that is true, except that the data that is coming back is designed to suit agency need and we are not designing data, for example, to meet the needs of private entrepreneurs. Is that a fair statement?

Mr. GIBBONS. That may be the case, although synoptic data, roughly the repetitive rate that we have and roughly with the present resolution, doesn't seem to be that far off the course in terms of what private sector people we have talked with feel is important. I don't feel, in other words, that the design of the bird, the rate at which data are taken off at some place, the resolution and the like, are seen by the private sector to be a mismatch to their ultimate potential need.

Mr. WALKER. Based upon where we are now, it could be with a more aggressive type of market you could find all kinds of people out there who have absolutely no perception at the present time they could use a satellite for any reason who might well come forward in an aggressive market situation, and say that yes, indeed, they now are convinced that they could use the data and would design a different kind of data collection. Isn't that entirely possible?

Mr. GIBBONS. I should think so. However, as we proceed in this technology, it is imperative to gather the collective wisdom of the potential users of the technology, whether they be public or private, in the design of future systems, whether they be public or private. Definitely and very properly so. So I must agree with you.

Mr. WALKER. I thank you and, as I say, that was not clear in your statement. I appreciate your statement. I am afraid that some people around here are more concerned with losing the power inherent in keeping all that data in the Government's hands and all of that spending in our hands than they are in moving it out to where more data might be collected and used better, and I sometimes find an inherent kind of unwillingness to move beyond where we are in bodies of this type that have a direct responsibility for some of these projects and programs.

Thank you, Mr. Chairman.

Mr. VOLKMER. Thank you, and, Dr. Gibbons, I will have additional questions for you, and I would appreciate your returning those as soon as possible because we will hold the record open until we get the written responses.

Mr. GIBBONS. Yes, sir.

[The biographical sketch of Mr. Townsend follows:]

Short Biography of John W. Townsend, Jr.

Dr. John W. Townsend, Jr., is a Vice President of Fairchild Industries, President of the Fairchild Space Company, and President and CEO of the Fairchild Space Operations Company. He was born in Washington, D.C., and attended Williams College where he received a BA in 1947, an MA in 1949, and a ScD (Hon.) in 1961 in Physics. During World War II he served as an officer in the Army Air Forces for over three years.

Dr. Townsend began his career at the Naval Research Laboratory in 1949 as a research physicist instrumenting V-2, Viking and Aerobee sounding rockets for upper air research. When NASA was created in 1958, he transferred with his Branch and the Vanguard Project, into the new Agency, becoming Chief of its Space Science Division. He was named Assistant Director, Space Science and Satellite Applications, of the NASA Goddard Space Flight Center in 1959, and Deputy Director in 1965.

In 1968, Dr. Townsend was appointed Deputy Administrator of the Environmental Science Services Administration in the Department of Commerce by President Johnson. Under a reorganization plan in 1970, this Agency became part of the National Oceanic and Atmospheric Administration (NOAA) and Dr. Townsend was appointed Associate Administrator by President Nixon. He ended thirty years of Federal Service in January of 1977. Since that time he has been employed by Fairchild Industries.

Dr. Townsend received the Navy's Meritorious Civilian Service Award in 1957, NASA's Medal for Outstanding Leadership in 1962, the Arthur S. Flemming Award in 1963, and the NASA Distinguished Service Medal in 1971.

Dr. Townsend is a member of the National Academy of Engineering and the International Academy of Astronautics. He is a Fellow of three professional societies, a member of three others, and has published a number of papers and articles. He is currently a member of the Space Applications Board, the Board on Atmospheric Sciences and Climate, and the Committee on NASA Program Changes, all of the National Research Council.

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STATEMENT OF JOHN W. TOWNSEND, PRESIDENT, FAIRCHILD SPACE CO.

Mr. VOLKMER. Mr. Townsend, your statement will be made a part of the record, and you may either review it in total or summarize it, however you so desire.

Mr. TOWNSEND. I think I can read it pretty quickly, Mr. Chairman, and I prefer doing it that way because there are some statements in here I would like to be precise on.

Mr. Chairman, thank you for the opportunity to testify today concerning this administration's proposed transfer of civil space remote sensing to the private sector.

Throughout almost 35 years of experience in this Nation's space program, I have been firmly convinced that the use of space for beneficial practical purposes holds great promise. In fact, we have already seen this in the case of communications and meteorological satellites. Currently, the horizon for the commercialization of space is so broad that my own company is committed to a venture in which a large, shuttle-launched spacecraft, built with private capital, will be placed permanently in orbit. During its planned lifetime of 12 years, we propose to lease payload space for use by commercial and governmental experimenters, data collectors, and producers of materials in space.

We call the spacecraft Leasecraft, and a key part of our strategy is to change payloads, replenish expendables, and repair the satellite, if required, all on orbit, thus saving on transportation and capital costs. You will note that we are making full use of the shuttle's unique capabilities and this use in turn should lower costs to all users of the shuttle by providing a larger business base.

However, Mr. Chairman, as bullish as I am over the future for commercial space activities, I am opposed to the plans of the present administration to transfer land remote sensing and meteorological satellites to the private sector. My concerns have to do with the existence of a market for the products, lack of competition, cost to the Government, possible misuse of proprietary data, our international posture, and national security. I will address each of these in turn.

With respect to the market, there is little or no current market for basic meteorological products outside of the Government and one will never develop unless we make a fundamental policy change to charge our citizens directly for these services. In the case of Earth resources, there is at present a small and emerging market. In my view it will be 5 to 10 years, assuming no break in current operations and service, before this market becomes large enough to even begin to support a system as expensive as Landsat.

The simple point here is that the Government is the only significant customer for space remote sensing products and, given the lack of outside customers to increase the business base, there is no reason to expect that the price to the taxpayer will decrease soon due to sharing of costs with a large commercial market. It may eventually happen, but it will be well into the future.

My second concern is that I see no way to provide for competition in the present scheme. The winner will hold a monopoly. I do not know what price the administration has set for the assets of

the existing Landsat, TIROS, and Goes systems, but it is my judgment that an investment of well over $1 billion would be required if one were starting from scratch.

Given the market outlook that I have described and the level of investment required, I am reasonably certain that only a very few large firms can even bid in the first place and that it would be next to impossible to bring into being two truly competitive systems in space operated by different entities. Foreign competition may provide an answer, but since this would probably be subsidized, the U.S. firm would be in a catch-22 situation.

If my thesis concerning the market is correct and if we create a monopoly provider of space remote sensing products, I see no reason to believe that the price of these products will be any different than it is now, and if anything, it will go up. This statement will probably be viewed as heresy by my industrial colleagues, but the real forcing function for increasing industrial productivity and efficiency is competition. In a sole-source situation, the only management motivation is to increase profits as far as possible until checked through regulation or negotiation. Aside from this major factor, other aspects of Government versus private sector costs may well be a "wash" in a case such as this. Wages are comparable. Overhead costs are probably truly lower in industry, but in the case of the Government, they are not accounted for in an explicit fashion when an agency is requesting money from Congress, thus making it difficult to document how much lower. The cost of money is a few points more expensive to the private sector than to the Treasury, but one can argue that reducing Government competition for money is a benefit to the economy. Finally, the price of space products must be increased to provide a reasonable profit to industry. Again, on the other hand, the Treasury receives money in the form of income taxes on this profit, so at least a half comes back.

In summary, Mr. Chairman, given competition, I would give the nod to industry as the low cost producer; given a lack of competition, I believe there will be no real saving over present costs and the price of the products will go up.

Next I would like to very simply address a complex issue, that of possible proprietary rights in space data. Are we prepared to transfer to private enterprise absolute control over meteorological data that could affect the safety of lives and property? This may be an extreme view in the case of the United States since it would probably not be allowed to happen, but how about other countries? Will the ability to pay determine the level of essential services? Will our withholding data result in retaliatory action on the part of others by withholding data critical to our own needs, both civil and military? The answers may seem obvious but working out the details of such a radical change in policy, as compared to past practices, may prove very thorny indeed if the object is to end up with a viable private enterprise. Concerning the proprietary aspects of Landsat data, we have a different class of problems. Over the years it has been difficult enough for our Government to allay the fears of a number of nations concerning U.S. "spying" on their natural resources and the possible exploitation of such knowledge for com-

mercial benefit. Quite frankly, I don't know how to handle this problem if space Earth resource data becomes private property.

Many aspects of my next concern, that of our international posture, have just been outlined; however, there is more to the problem in the case of meteorology. Since the late 1800's, there has been an international practice of free exchange of meteorological data at no cost. The basis for this has been self interest on the part of all nations. One cannot forecast the weather and warn of storms with only local or regional data. In fact, to forecast expertly for over 3 to 5 days requires a hemispheric data set and, much beyond this, a global data set. This international exchange of data has been coordinated through the World Meteorological Organization, a specialized agency of the United Nations, and its predecessor organizations. We, in the United States, have learned through experience that this is no one-way exchange; we get much more than we give. Since President Kennedy's declaration that we intended to develop space for peaceful uses to the benefit of all mankind, and his specific reference to meteorological satellites, a cooperative program in space has developed in an atmosphere of mutual trust. Today, Europe and Japan have synchronous meteorological satellites that complement our own and provide almost global coverage. India will launch this summer and the U.S.S.R continues to state that it will fill an orbital slot in the near future. In the case of polar orbiting satellites, the English and French provide instruments for our spacecraft, and this country regularly exchanges satellite data with the Russians. Although it may be true that the United States will not violate any treaties if we pass control from the Government to the civil sector and begin to charge for data and services, I am sure that our proposals will cause—and in fact already have caused—widespread alarm and concern over our intent and will do much to undermine two decades of international cooperative progress and exchange in space meteorology.

My final concern, national security, is a difficult one to handle for two reasons. First, I have personally been away from the scene for a number of years and, second, there are matters that involve classified information. However, it is common knowledge that NOAA's polar orbiting meteorological satellites back up DOD's defense meteorological satellites and vice versa. This is no mere contingency plan; it has been activated on at least one occasion. A key worry is what happens to this backup if the commercial enterprise fails, to say nothing about the loss of civil data? What happens to the commercial space remote sensing system during a period of national emergency such as a military crisis? I do not claim that I can answer these questions, but the critical point is that they must be addressed and settled before the RFP to industry is released. Nobody in his right mind would bid a job of this sort with major policy issues like these left hanging.

Two final points, Mr. Chairman. As I understand the administration's proposed procedure for transfer of space remote sensing to the private sector, an RFP will be released to industry followed by an evaluation and selection of a source if the bidder meets the Government's terms and conditions. Then and only then will draft legislation be sent to the Congress to effect the change. How will industry view the likelihood of a law being enacted without change?

Suppose there are changes that affect the way the proposal has been submitted; how will industry view the additional cost of reproposing? Even if I were inclined to respond to the RFP, which I am not, I would be very wary because preparation of a proposal for a job of this magnitude costs several millions of dollars and I would want to be convinced that the task was real and that I would not waste additional money waiting for a long period of time and then possibly having to repropose.

The last point concerns the fate of the R&D program that has made what we have today possible. During the present hiatus, NASA has virtually eliminated its efforts and NOAA has no money to pick them up. Will the commercial enterprise be expected to undertake this very expensive task which involves risky development of new instruments and techniques, or will the Government continue it? Whatever happens to the operational system, we must make certain that U.S. leadership in the disciplines of Earth remote sensing—land sensing, atmospheric sensing, and ocean sensing—is not dissipated while ideology and philosophy are under heated debate.

Mr. Chairman, I wish I could end this testimony on a positive note, but I find it hard to do so. Clearly, I am opposed to the current plans. But what is the alternative? I suggest that a simple, conservative approach be taken. Continue the civil space remote sensing systems under Government operation. In the case of meteorology, encourage commercial industry to provide value-added products and services tailored to the needs of the special user and interests, but continue to provide basic data and services as a Government function. General forecasts, watches and warnings are services that the Government must provide freely to all citizens. In the case of land remote sensing and in the future ocean remote sensing, save storm and wave forecasts and warnings and data essential to our military, move vigorously to transfer as much of the data handling and product preparation to the commercial sector as possible. This includes all data and services. If a market does indeed develop in the future to support large and complex land and sea remote sensing satellites, fine, transfer the systems when competition can be assured.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Townsend follows:]

TESTIMONY BEFORE THE SUBCOMMITTEES ON SPACE
SCIENCE & APPLICATIONS & NATURAL RESOURCES,
AGRICULTURE RESEARCH & ENVIRONMENT OF THE
HOUSE COMMITTEE ON SCIENCE & TECHNOLOGY

BY DR. JOHN W. TOWNSEND, JR.

JUNE 21, 1983

Mr. Chairmen, thank you for the opportunity to testify today concerning this Administration's proposed transfer of civil space remote sensing to the private sector.

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Thank you, Mr. Chairmen.

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Mr. VOLKMER. Thank you very much, Mr. Townsend. I now recognize the gentleman from New York, Mr. Scheuer. We will be going, because we are running out of time, under the 5-minute rule.

Mr. SCHEUER. Very good. Mr. Chairman, I have about three questions. Why don't I ask all three of them and if the witness cannot complete in time, maybe he can give us the remainder of his answers in writing.

On the last page of your testimony you have indicated that industry is going to respond very warily to an RFP that isn't well buttressed by a statement of congressional policy, as expressed in legislation. I happen to agree with you very strongly. I made that statement here this morning.

Do you think that in the absence of a legislative framework, a legislative environment in which an RFP can be placed in context, that industry is likely to be forthcoming in response to an RFP, or do you think that your very wary, guarded response is going to be typical?

Mr. TOWNSEND. It is my belief that my response will be typical.

Mr. SCHEUER. And if your response is typical, what do we learn from an RFP except that they should have held their fire until we had set the ground rules in some kind of legislative format?

Mr. TOWNSEND. Yes, I agree, I think that most of us in industry would much prefer the legislative framework and certainty that indeed some action was going to be taken along certain public policy lines. Then, planning for the cost of preparation of the proposal and interfacing with the customer are relatively straightforward.

Mr. SCHEUER. On page 4, let me ask my two questions now, and you can get as far as you can, and then give it to us in writing.

On page 4, the end of your testimony, you recommend a continuing civil space remote sensing system under Government operation.

What is your estimate of the cost of maintaining the land remote sensing capability in the Federal Government? Would it make sense to retain the space systems in the Government but to auction off to the commercial sector the rights to market the data guaranteed by this system?

That is one question, and my last question is, you mentioned that charging fees for weather data could lead to retaliation on the part of others who might withhold data critical to our own needs, both civil and military.

Would it be possible for us to allow the National Weather Service to distribute data, weather data internationally, as it does now, but permit a commercial operator to distribute and permit a commercial operator to distribute it domestically and charge, I suppose, whatever the market could bear, presumably a new and enhanced market the commercial operator would develop? If you could answer those two questions.

Mr. TOWNSEND. All right, I will try.

My understanding, and my own estimate of the cost of maintaining the Landsat system, would be somewhere in the vicinity of $30 million a year for operations, net of receipts from sales of data. The big unknown, of course, is the satellite system. There is another satellite that has been purchased but launch has not been provided

for. To launch that satellite would probably cost something in the neighborhood of $50 million.

Now, the price of new Landsat satellites is probably something like $200 to $250 million launched. I say "probably" because it would depend upon the number you ordered—because they are cheaper in quantity—and also on the discipline that was established in keeping changes to the satellite to a minimum because they are very expensive.

So, in summary, something like $30 million continuing costs, and you are going to have to launch the next satellite, so there is $50 million, and if it becomes necessary to launch another or even more, approximately $200 to $250 million each, launched.

Let me say Landsat was designed for in-orbit repair. My company has already looked at the problems of repairing the current Landsat that is up there now, and we believe it can be done in the same way that we are going to repair the Solar Maximum Mission satellite next spring. You may recall that we built the spacecraft bus for both missions.

The only difficulty is that the Landsat is a polar orbit, so we have to wait until we have shuttle capability from the west coast. I think it is perfectly possible to repair satellites in orbit, so you may not have to buy a large number of new ones. In fact, I think that is the way to go in the future.

Now, you asked me a question about auctioning off the rights to market the data. I think in the case of——

Mr. SCHEUER. Giving it away internationally.

Mr. TOWNSEND. I was talking about Landsat. I think you could auction off those rights.

Now, in the case of the Metsat data, yes, you could indeed tell the U.S. operator to provide the international data free. It would certainly restrict his market. He has to have a market out there to make money on, so you have taken away a big part of his potential.

Mr. SCHEUER. International market?

Mr. TOWNSEND. That is right.

Now, in the case of the national market, I would shudder to think what would happen if our citizens got charged for those data, either directly, or indirectly in such a fashion that it were visible. I can't imagine that.

Mr. SCHEUER. Thank you very much. Thank you, Mr. Chairman.

Mr. VOLKMER. Thank you.

The gentleman from Florida, Mr. MacKay.

Mr. MACKAY. Dr. Townsend, I think you are saying that we should as part of our policy for commercialization, we shoud always try to create a situation where there will be competition, that that is the one thing that is essential for in effect privatization to be of more benefit to the public than letting the Government do it.

Mr. TOWNSEND. Yes; I am saying that; otherwise what you are doing in effect is contracting out. I think if you strip the present proposition out from under all of the chaff what you find is really a proposition to put the system under contract.

Mr. MACKAY. You are saying that not only is there no inherent advantage in there, there may well be some inherent disadvantage?

Mr. TOWNSEND. Yes, I believe that is the case.

Mr. MACKAY. Do you believe that we would be better off reversing the process of putting it out for bids and then finding out how it will be bid and then trying to pass a law and instead go ahead and try to hold hearings and bring in the potential bidders, as yourself, the people who really thought through this, get their views, hear it all out in public debate and then develop a policy so people would understand and could plan on the course of action of the U.S. Government, or are you saying that would be the better approach?

Mr. TOWNSEND. Yes. And it would be by far the less expensive approach both to the Government and to the private sector, because if I believe, the trade press, the Department of Commerce asked for something like $1 million to cover all of their activities that are going on in preparing an RFP.

As I said, each company that responds is putting in a minimum, I would guess, of $2 million. If this thing stretches out for more than a year, you have to keep your people going, you can't have them finish the proposal and then just disappear somewhere. So there goes more money.

So private industry is going to invest a fair bit in the bidding, assuming you get more than one bid.

Mr. MACKAY. All right, thank you, Mr. Chairman.

Mr. VOLKMER. Thank you.

Mr. Townsend, I have several questions and then I may have a few more that I will submit to you in writing for purposes of time today.

But I would like to have your feeling whether or not it is important that we have a U.S. operational civil space remote sensing capability for land sensing?

Mr. TOWNSEND. Yes, I certainly feel it is very important.

Mr. VOLKMER. And that do you foresee, as the previous witness did, a cost to this country both in social and economic if we do not?

Mr. TOWNSEND. Yes, sir.

Mr. VOLKMER. Now, I think it is very obvious that the answer on our Metsat would be the same.

Mr. TOWNSEND. Absolutely.

Mr. VOLKMER. So you do not feel, in other words, commercialization of Metsat is in the national interest as far as you can see?

Mr. TOWNSEND. Not in the national interest, and I don't believe it is in the international interest in the sense of our country participating along with other nations in something that effects the safety of lives and property.

Mr. VOLKMER. I am sure you have heard some members of this subcommittee here with their questions on the weather satellite and I have had other members express to me the viewpoint that they are just outright opposed to it.

Within the unknown in the Congress as to whether there is anything foreseen down the future, if Congress is only to react after RFP's are responded to, and given their approval, do you believe that private enterprise would be willing to go to the expense and make a response knowing those uncertainties concerning weatherization?

Mr. TOWNSEND. I think that the Department of Commerce will receive a proposal from Comsat because it is my belief that Comsat

feels very strongly that the meteorological satellites must be in the package to make it viable. I do not know of anybody else who will bid.

Mr. VOLKMER. Would it not be better if the Congress had made basic policy decisions beforehand with legislation?

Mr. TOWNSEND. Absolutely.

Mr. VOLKMER. Thank you very much.

We will have some additional questions for you, and we would appreciate you getting them as soon as possible, and we will hold the record open until we have those in.

Mr. TOWNSEND. Thank you, sir.

STATEMENT OF RAYMOND G. KAMMER, JR., CHAIRMAN, SOURCE EVALUATION BOARD OF CIVIL SPACE REMOTE SENSING

Mr. VOLKMER. Our final witness today is Raymond Kammer, Jr., chairman of the Source Evaluation Board on Civil Space Remote Sensing. We welcome you here, Mr. Kammer, and your statement will be made a part of the record, and you may either review it in total or you may summarize, however you see fit.

Mr. KAMMER. Thank you, sir.

I am pleased to be here today to testify on several aspects of the plan to evaluate transferring civil land and weather satellites to the private sector. Secretary Baldrige testified before your two subcommittees on April 14, 1983, on this issue. The Source Evaluation Board [SEB], of which I am chairman, has been working since that time to develop a process to evaluate this plan.

I would like to review for you the schedule of SEB activities and the process we will follow. The SEB consists of eight members, representing NASA and the Departments of Commerce, Defense, Interior, and State. We have five additional people serving on the staff of the SEB to provide technical and administrative support.

Also reporting to the SEB are three advisory committees: A business advisory committee, a technical advisory committee, and a legal advisory committee. These committees have between 6 and 10 members each, selected again from various agencies with the experience required for the assignment.

The SEB charter, as approved by the Secretary of Commerce, instructs the SEB to evaluate proposals for transfer to the private sector of satellite systems for land remote sensing and/or civilian weather data. We will develop and issue a request for proposal [RFP], evaluate industry responses and present a report to the Secretary of Commerce for his decision. The SEB charter specifies that during all phases of this process we will insure that national security and international commitments are adequately addressed, that weather service data needs are guaranteed and that major component bids can be compared with total system bids.

The SEB has developed a detailed milestone schedule, which I will summarize. We expect to complete the development of a draft request for proposal by September 1983. We intend that this draft RFP will be released for public comment during October 1983. The final RFP, we hope, will be issued about late November 1983.

Industry will prepare its bids and submit them around the first of February 1984. The SEB will evaluate the proposals from Febru-

ary to April, and present recommendations to the Secretary of Commerce in May 1984. This schedule includes a number of points where we think congressional input would be especially useful.

A very important issue that we must resolve early in the development of the RFP is at what system level or component size should we scope the RFP? This issue is under active discussion right now. I hope the committee will see fit to give me some reaction to it.

The RFP must provide sufficient guidance so that the responses permit the SEB to evaluate component bids, make comparisons among them and compare them to total system costs. This would argue for specifying large packages for proposals. By contrast, smaller packages might encourage more competition.

The total system consists of separate satellite systems: Landsat, geostationary weather and polar weather. Each of these component systems is composed of the satellites, ground stations for command and control, tracking and data transfer, and ground systems for preprocessing the data, which includes timing, rectifying, Earth locating and calibrating.

Separation of the satellites, ground station activities, and preprocessing units for bidding purposes would be difficult but feasible technically. It would, however, require that the Federal Government stay in the business as manager of the system function, since these three components must work closely together and there has to be a single point of accountability.

The SEB is, therefore, working on a statement of scope which will enable industry to bid on a set of components which is as small as technically intelligent, and which will permit the Federal Government to stop being the day-to-day manager of the system.

Our current plan is to request bids for the separate systems of Landsat, geostationary weather and polar weather. A bid could also be made for two or all three systems. We do not currently plan to allow further separation of these functions, but to require bids for satellites, tracking and preprocessing as a single unit for each system.

Competition and wider participation of U.S. industry could be encouraged by requiring subcontractor plans in the proposals. Subcontractor participation could then be an element of evaluation during proposal review.

Our current plan is not to compete in any way in the value-added areas. The Government would perform value-added activities necessary for its internal programs. A plan with a schedule for the Government to phase out of value-added services that compete in the public market would need to be worked out, but I believe that it is feasible.

Your letter asked how the SEB process would be conducted so as to avoid even the appearance of impropriety or favoritism. Our legal advisory committee has developed an extensive guideline document for SEB operations, which I would also be pleased to introduce into the record.

I am on assignment from the National Bureau of Standards, an agency which has no stake in the outcome of this process. I personally have no preconceived notion or prejudice as to how this entire process should be conducted or what the outcome should be. My fi-

nancial disclosure statement, with disclosure statements for all members of the SEB, its senior staff and advisory committees, have been requested and will be carefully reviewed to insure that no one working on this project has a financial interest that creates even an appearance of conflict of interest.

In addition, these individuals were briefed on this issue and cautioned to consult with the Department of Commerce's Office of General Counsel if they had any doubts or questions.

We are conducting the development of the draft RFP in as open and public a way as we can. We will shortly publish our charter and milestone plan as well as an invitation for interested parties to contact us with their views.

As the Secretary has promised, I will do my best to keep Congress informed and seek your opinions and advice during the development of the RFP. Once bids from industry are received, we must perform our evaluation of these bids by a process in which the SEB communicates only with itself. However, I do hope to begin discussions on draft legislation at a policy level with Congress in April 1984.

Now, Mr. Chairman, turning to the four questions raised in your letter of invitation:

Question No. 1. You ask how we will consider and allow for institutional alternatives. The scoping process, which I just described, will allow industry to bid on components of the system or on a total system. In addition, the SEB will develop what I refer to as the Government bid. This bid will be developed after careful evaluation of Government assets, the current cost to the Government of maintaining and operating each system and the requirements of mission agencies like the National Weather Service [NWS].

As Secretary Baldrige discussed with you, this sale should be a good deal for the American taxpayer. The development of the Government bid provides an opportunity for the Secretary to compare private sector bids with current Government costs.

Question No. 2. You ask how we would allow and encourage competition during the initial selection and thereafter. The scope process will encourage competition in the initial selection. In addition, our current thinking is that the final contract would require the system operator to sell data to any interested parties. Potentially competitive satellite systems are planned by other countries and several U.S. companies. These systems should provide competition for the successful bidders.

Question No. 3. You ask how we would manage a commercial failure. This is a very important question, and one that our Business Advisory Committee is working on. We are considering a number of approaches. The financial viability and forecasted staying power of the bidders would clearly be part of the evaluation criteria, as well as detailed analyses of their business plans.

Additionally, provisions in the final contract could include retention of title to equipment by the Government during the transition period, prohibiting sell-out or transfer by the contractor, specification of minimum debt/equity ratios (leverage) and current ratios (liquidity), and dividend payouts for the contractor; things equivalent to provisions imposed by bondholders to protect their invest-

ments. We would certainly welcome your suggestions on this matter.

Question No. 4. You ask how the financial and tax aspects of any commercialization will be treated to insure the best deal for the taxpayer. This process will be carried out in a competitive manner and the development of the Government bid will also provide a comparison for the Secretary of Commerce, the selecting official.

In the long run, the Federal Government's cost will be what we for land- and weather-forecast input data and R&D activities h continue in Federal agencies. During the transition phase to private-sector ownership and operation, if this happens, there may be additional costs. From the Federal Government's point of view, tax preferences sought by proposers should be considered as additional costs and, of course, would require legislation as well.

The SEB, with the assistance of a contracted public accounting firm, will analyze the effect on income taxes of depreciation, research and development credits, and investment tax credits, as appropriate. These and other costs will certainly constitute evaluation factors for comparisons among bidders.

I would be pleased to try and answer your questions.

[The prepared statement of Raymond G. Kammer, Jr., follows:]

STATEMENT OF
RAYMOND G. KAMMER, JR.
CHAIRMAN, SOURCE EVALUATION BOARD
ON CIVIL SPACE REMOTE SENSING

BEFORE THE

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE
RESEARCH AND ENVIRONMENT
AND THE
SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS
COMMITTEE ON SCIENCE AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

JUNE 21, 1983

MESSRS. CHAIRMEN AND MEMBERS OF THE COMMITTEE:

I AM PLEASED TO BE HERE TODAY TO TESTIFY ON SEVERAL ASPECTS OF THE PLAN TO EVALUATE TRANSFERRING CIVIL LAND AND WEATHER SATELLITES TO THE PRIVATE SECTOR. SECRETARY BALDRIGE TESTIFIED BEFORE YOUR TWO SUBCOMMITTEES ON APRIL 14, 1983, ON THIS ISSUE. THE SOURCE EVALUATION BOARD (SEB), OF WHICH I AM CHAIRMAN, HAS BEEN WORKING SINCE THAT TIME TO DEVELOP A PROCESS TO EVALUATE THIS PLAN.

I WOULD LIKE TO REVIEW FOR YOU THE SCHEDULE OF SEB ACTIVITIES AND THE PROCESS WE WILL FOLLOW. THE SEB CONSISTS OF SEVEN MEMBERS, REPRESENTING NASA AND THE DEPARTMENTS OF COMMERCE, DEFENSE AND STATE. WE HAVE FIVE ADDITIONAL PEOPLE SERVING ON THE STAFF OF THE SEB TO PROVIDE TECHNICAL AND ADMINISTRATIVE SUPPORT. ALSO REPORTING TO THE SEB ARE THREE ADVISORY COMMITTEES: A BUSINESS ADVISORY COMMITTEE, A TECHNICAL ADVISORY COMMITTEE AND A LEGAL

DRAFTING COMMITTEE. THESE COMMITTEES HAVE BETWEEN SIX AND 10 MEMBERS EACH, SELECTED AGAIN FROM VARIOUS AGENCIES WITH THE EXPERIENCE REQUIRED FOR THE ASSIGNMENT.

THE SEB CHARTER, AS APPROVED BY THE SECRETARY OF COMMERCE, INSTRUCTS THE SEB TO EVALUATE PROPOSALS FOR TRANSFER TO THE PRIVATE SECTOR OF SATELLITE SYSTEMS FOR LAND REMOTE SENSING AND/OR CIVILIAN WEATHER DATA. WE WILL DEVELOP AND ISSUE A REQUEST FOR PROPOSAL (RFP), EVALUATE INDUSTRY RESPONSES, AND PRESENT A REPORT TO THE SECRETARY OF COMMERCE FOR HIS DECISION. THE SEB CHARTER SPECIFIES THAT DURING ALL PHASES OF THIS PROCESS WE WILL INSURE THAT NATIONAL SECURITY AND INTERNATIONAL COMMITMENTS ARE ADEQUATELY ADDRESSED, THAT WEATHER SERVICE DATA NEEDS ARE GUARANTEED, AND THAT MAJOR COMPONENT BIDS CAN BE COMPARED WITH TOTAL SYSTEM BIDS.

THE SEB HAS DEVELOPED A DETAILED MILESTONE SCHEDULE, WHICH I HAVE SUMMARIZED HERE FOR THE RECORD. WE EXPECT TO COMPLETE THE DEVELOPMENT OF A DRAFT REQUEST FOR PROPOSAL (RFP) BY SEPTEMBER, 1983. THIS DRAFT RFP WILL BE RELEASED FOR PUBLIC COMMENT DURING OCTOBER, 1983. THE FINAL RFP WILL BE ISSUED ABOUT LATE NOVEMBER, 1983. INDUSTRY WILL PREPARE ITS BIDS AND SUBMIT THEM AROUND THE FIRST OF FEBRUARY, 1984. THE SEB WILL EVALUATE THE PROPOSALS FROM FEBRUARY TO APRIL, 1984, AND PRESENT RECOMMENDATIONS TO THE SECRETARY OF COMMERCE IN MAY, 1984. THIS SCHEDULE INCLUDES A NUMBER OF POINTS WHERE WE THINK CONGRESSIONAL INPUT WOULD BE ESPECIALLY USEFUL.

A VERY IMPORTANT ISSUE THAT WE MUST RESOLVE EARLY IN THE DEVELOPMENT OF THE RFP IS AT WHAT SYSTEM LEVEL OR COMPONENT SIZE SHOULD WE SCOPE THE RFP? THE RFP MUST PROVIDE SUFFICIENT GUIDANCE SO THAT THE RESPONSES PERMIT THE SEB TO EVALUATE COMPONENT BIDS, MAKE COMPARISONS AMONG THEM AND COMPARE THEM TO TOTAL SYSTEM COSTS. THIS WOULD ARGUE FOR SPECIFYING LARGE PACKAGES FOR PROPOSALS. BY CONTRAST, SMALLER PACKAGES MIGHT ENCOURAGE MORE COMPETITION.

THE TOTAL SYSTEM CONSISTS OF SEPARATE SATELLITE SYSTEMS -- LANDSAT, GEOSTATIONARY WEATHER, AND POLAR WEATHER. EACH OF THESE COMPONENT SYSTEMS IS COMPOSED OF THE SATELLITES, GROUND STATIONS FOR COMMAND AND CONTROL, TRACKING AND DATA TRANSFER, AND GROUND SYSTEMS FOR PREPROCESSING THE DATA WHICH INCLUDES TIMING, RECTIFYING, EARTH LOCATING AND CALIBRATING.

SEPARATION OF THE SATELLITES, GROUND STATION ACTIVITIES, AND PREPROCESSING UNITS FOR BIDDING PURPOSES WOULD BE DIFFICULT BUT FEASIBLE TECHNICALLY. IT WOULD, HOWEVER, REQUIRE THAT THE FEDERAL GOVERNMENT STAY IN THE BUSINESS AS MANAGER OF THE SYSTEM FUNCTION, SINCE THESE THREE COMPONENTS MUST WORK CLOSELY TOGETHER, AND THERE MUST BE A SINGLE POINT OF ACCOUNTABILITY.

THE SEB IS, THEREFORE, WORKING ON A STATEMENT OF SCOPE WHICH WILL ENABLE INDUSTRY TO BID ON A SET OF COMPONENTS WHICH IS AS SMALL AS TECHNICALLY INTELLIGENT, AND WHICH WILL ALLOW THE FEDERAL GOVERNMENT TO STOP BEING THE DAY-TO-DAY MANAGER OF THE

SYSTEM. WE PLAN TO REQUEST BIDS FOR THE SEPARATE SYSTEMS OF LANDSAT, GEOSTATIONARY WEATHER AND POLAR WEATHER. A BID COULD ALSO BE MADE FOR ALL THREE SYSTEMS. WE DO NOT PLAN TO ALLOW FURTHER SEPARATION OF THESE FUNCTIONS, BUT TO REQUIRE BIDS FOR SATELLITES, TRACKING AND PREPROCESSING AS A SINGLE UNIT FOR EACH SYSTEM. COMPETITION AND WIDER PARTICIPATION OF U.S. INDUSTRY CAN BE ENCOURAGED BY REQUIRING SUBCONTRACTOR PLANS IN THE PROPOSALS. SUBCONTRACTOR PARTICIPATION CAN THEN BE AN ELEMENT OF EVALUATION DURING PROPOSAL REVIEW. OUR CURRENT PLAN IS NOT TO COMPETE IN ANY WAY IN THE VALUE-ADDED AREAS. THE GOVERNMENT WILL PERFORM VALUE-ADDED ACTIVITIES NECESSARY FOR ITS INTERNAL PROGRAMS. A PLAN WITH A SCHEDULE FOR THE GOVERNMENT TO PHASE OUT OF VALUE-ADDED SERVICES THAT COMPETE IN THE PUBLIC MARKET NEEDS TO BE WORKED OUT, BUT I BELIEVE THAT IT IS FEASIBLE.

YOUR LETTER ASKED HOW THE ABOVE PROCESS WOULD BE CONDUCTED SO AS TO AVOID EVEN THE APPEARANCE OF IMPROPRIETY OR FAVORITISM. OUR LEGAL ADVISORY COMMITTEE HAS DEVELOPED AN EXTENSIVE GUIDELINE DOCUMENT FOR OPERATION OF THE SEB, WHICH I WOULD ALSO BE PLEASED TO INTRODUCE INTO THE RECORD. I AM ON ASSIGNMENT FROM THE NATIONAL BUREAU OF STANDARDS, AN AGENCY WHICH HAS NO STAKE IN THE OUTCOME OF THE PROCESS. I HAVE NO PRECONCEIVED NOTION

OR PREJUDICE AS TO HOW THIS ENTIRE PROCESS SHOULD BE CONDUCTED OR WHAT THE OUTCOME SHOULD BE. MY FINANCIAL DISCLOSURE STATEMENT, WITH DISCLOSURE STATEMENTS FOR ALL MEMBERS OF THE SEB, ITS SENIOR STAFF AND ADVISORY COMMITTEES, HAVE BEEN REQUESTED AND WILL BE CAREFULLY REVIEWED TO INSURE THAT NO ONE WORKING ON THIS PROJECT HAS A FINANCIAL INTEREST THAT CREATES EVEN AN APPEARANCE OF CONFLICT OF INTEREST. IN ADDITION, THESE INDIVIDUALS WERE BRIEFED ON THIS ISSUE AND CAUTIONED TO CONSULT THE DEPARTMENT OF COMMERCE'S OFFICE OF GENERAL COUNSEL IF THEY HAD ANY DOUBTS OR QUESTIONS.

WE ARE CONDUCTING THE DEVELOPMENT OF THE DRAFT RFP IN AS OPEN AND PUBLIC A WAY AS POSSIBLE. WE WILL SHORTLY PUBLISH OUR CHARTER AND MILESTONE PLAN AS WELL AS AN INVITATION FOR INTERESTED PARTIES TO CONTACT US WITH THEIR VIEWS.

AS THE SECRETARY HAS PROMISED, I WILL KEEP CONGRESS INFORMED AND SEEK YOUR OPINIONS AND ADVICE DURING THE DEVELOPMENT OF THE RFP. ONCE BIDS FROM INDUSTRY ARE RECIEVED, WE MUST PERFORM OUR EVALUATION OF THESE BIDS BY A PROCESS IN WHICH THE SEB COMMUNICATES ONLY WITH ITSELF. HOWEVER, I DO HOPE TO BEGIN DISCUSSIONS ON DRAFT LEGISLATION AT A POLICY LEVEL IN APRIL OF 1984.

NOW MR. CHAIRMAN, TURNING TO THE FOUR QUESTIONS RAISED IN YOUR LETTER OF INVITATION:

<u>QUESTION 1</u> - YOU ASK HOW WE WILL CONSIDER AND ALLOW FOR INSTITUTIONAL ALTERNATIVES. THE SCOPING PROCESS, WHICH I

DESCRIBED ABOVE, WILL ALLOW INDUSTRY TO BID ON COMPONENTS OF THE SYSTEM OR ON A TOTAL SYSTEM. IN ADDITION, THE SEB WILL DEVELOP WHAT I REFER TO AS THE "GOVERNMENT BID". THIS BID WILL BE DEVELOPED AFTER CAREFUL EVALUATION OF GOVERNMENT ASSETS, THE CURRENT COST TO THE GOVERNMENT OF MAINTAINING AND OPERATING EACH SYSTEM AND THE REQUIREMENTS OF MISSION AGENCIES LIKE THE NATIONAL WEATHER SERVICE (NWS). AS SECRETARY BALDRIGE DISCUSSED WITH YOU, THIS SALE SHOULD BE A GOOD DEAL FOR THE AMERICAN TAXPAYER. THE DEVELOPMENT OF THE "GOVERNMENT BID" PROVIDES AN OPPORTUNITY FOR THE SECRETARY TO COMPARE PRIVATE SECTOR BIDS WITH CURRENT GOVERNMENT COSTS.

QUESTION 2 - YOU ASK HOW WE WOULD ALLOW AND ENCOURAGE COMPETITION DURING THE INITIAL SELECTION AND THEREAFTER. THE SCOPE PROCESS WILL ENCOURAGE COMPETITION IN THE INITIAL SELECTION. IN ADDITION, OUR CURRENT THINKING IS THAT THE FINAL CONTRACT WILL REQUIRE THE SYSTEM OPERATOR TO SELL DATA TO ANY INTERESTED PARTIES. POTENTIALLY COMPETITIVE SATELLITE SYSTEMS ARE PLANNED BY OTHER COUNTRIES AND SEVERAL U.S. COMPANIES. THE EXISTENCE OF THESE SYSTEMS SHOULD PROVIDE COMPETITION FOR THE SUCCESSFUL BIDDERS.

QUESTION 3 - YOU ASK HOW WE WOULD MANAGE A COMMERCIAL FAILURE. THIS IS A VERY IMPORTANT QUESTION, ONE THAT OUR BUSINESS ADVISORY COMMITTEE IS WORKING ON. WE ARE CONSIDERING A NUMBER OF APPROACHES. OBVIOUSLY, THE FINANCIAL VIABILITY AND

FORECASTED STAYING POWER OF THE BIDDERS WILL BE PART OF THE EVALUATION CRITERIA, AS WELL AS DETAILED ANALYSES OF THEIR BUSINESS PLANS. ADDITIONALLY, PROVISIONS IN THE FINAL CONTRACT MAY INCLUDE RETENTION OF TITLE TO EQUIPMENT BY THE GOVERNMENT DURING THE TRANSITION PERIOD, PROHIBITING SELL-OUT OR TRANSFER BY THE CONTRACTOR, SPECIFICATION OF MINIMUM DEBT/EQUITY RATIOS (LEVERAGE) AND CURRENT RATIOS (LIQUIDITY), AND DIVIDEND PAYOUTS FOR THE CONTRACTOR EQUIVALENT TO PROVISIONS IMPOSED BY BOND HOLDERS TO PROTECT THEIR INVESTMENTS. WE WOULD CERTAINLY WELCOME YOUR SUGGESTIONS ON THIS MATTER.

QUESTION 4 - YOU ASK HOW THE FINANCIAL AND TAX ASPECTS OF ANY COMMERCIALIZATION WILL BE TREATED TO ENSURE THE BEST DEAL FOR THE TAXPAYER. THIS PROCESS WILL BE CARRIED OUT IN A COMPETITIVE MANNER AND THE DEVELOPMENT OF THE "GOVERNMENT BID" WILL ALSO PROVIDE A COMPARISON FOR THE SECRETARY OF COMMERCE. IN THE LONG RUN, THE FEDERAL GOVERNMENT'S COST WILL BE WHAT WE PAY FOR LAND AND WEATHER-FORECAST INPUT DATA AND R&D ACTIVITIES WHICH CONTINUE IN FEDERAL AGENCIES. DURING THE TRANSITION PHASE TO PRIVATE-SECTOR OWNERSHIP AND OPERATION, THERE MAY BE ADDTIIONAL COSTS. FROM THE FEDERAL GOVERNMENT'S POINT OF VIEW, TAX PREFERENCES SOUGHT BY PROPOSERS SHOULD BE CONSIDERED AS ADDITIONAL COSTS AND OF COURSE WOULD REQUIRE LEGISLATION. THE SEB, WITH THE ASSISTANCE OF A CONTRACTED PUBLIC ACCOUNTING FIRM, WILL ANALYZE THE EFFECT ON INCOME TAXES OF DEPRECIATION, RESEARCH AND DEVELOPMENT CREDITS, AND INVESTMENT TAX CREDITS, AS APPROPRIATE. THESE AND OTHER COSTS WILL CERTAINLY CONSTITUTE EVALUATION FACTORS FOR COMPARISONS AMONG BIDDERS.

I WOULD BE PLEASED TO ANSWER YOUR QUESTIONS.

RAYMOND G. KAMMER, JR.

Deputy Director, National Bureau of Standards

on detail to
the Office of the Secretary of Commerce
as
Chairman, Source Evaluation Board for
Civil Space Remote Sensing

Raymond G. Kammer, Jr., became the Deputy Director of the National Bureau of Standards on September 14, 1980. NBS is the Nation's central reference laboratory, providing measurement methods, standards, and data that are used in industry, commerce, government, and universities. Bureau headquarters are located in Gaithersburg, Maryland, with a second laboratory at Boulder, Colorado. Total staff numbers about 3,500. As Deputy Director, Mr. Kammer is responsible for the efficient execution of the Bureau's operational programs. He coordinates, monitors, and assesses progress of all NBS technical projects, and of the supporting services.

Mr. Kammer joined NBS in 1969 as a management intern and program analyst. From 1971 to 1974, he served as program and budget analyst at the Department of Commerce. Returning to NBS as senior budget analyst, he subsequently served as senior program analyst, Associate Director for Programs, Budget, and Finance, and Director of Administrative and Information Systems.

Mr. Kammer received a Bachelor of Arts degree from the University of Maryland in 1969.

Mr. VOLKMER. At this time, I will recognize the gentleman from New Mexico for 5 minutes.

Mr. LUJAN. Thank you, Mr. Chairman.

Those RFP's that you will be considering, my understanding is they are not binding once you receive the RFP for the Government to go ahead and commercialize?

Mr. KAMMER. No, sir; they are not.

Mr. LUJAN. They are for the purpose of information really, as far as the Department is concerned?

Mr. KAMMER. In addition, in this case, the Secretary personally assured this committee that he believed legislation was needed to implement, in any event.

Mr. LUJAN. This government bid that you talked about, that is, I suppose, how you would like for it to come out?

Mr. KAMMER. It is an attempt on our part to try and think a bit like we think industry will think in looking at the proposal, and to try and think how a comparable effort by the Federal Government would stack up in terms of costs. It should give at least a scenario for comparison. Perhaps it would be a base line way of describing it, also.

Mr. LUJAN. That would be done after you received the proposals from industry?

Mr. KAMMER. I would like to outline it this summer and actually start developing it around the time that we release the RFP so that Goverment people are working on the Government bid during that same period the private proposers are working on theirs.

Mr. LUJAN. I thought there were some RFP's out already.

Mr. KAMMER. There is one RFP out related to my activity, which is for an audit.

Mr. LUJAN. Maybe RFP is not the thing in the formal sense, but there is a request out to industry: tell us what you think, how you would operate it, including costs, all of those different things?

Mr. KAMMER. There was an [request for information] last fall and there were 14 responses to that, of which 13 were negative. The firms felt that it was either very difficult to do or even unworkable, or they were opposed to it for reasons that they stated.

Mr. LUJAN. Then 13 of them said that it wouldn't work?

Mr. KAMMER. Or that they did not believe it ought to be done.

Mr. LUJAN. One said yes?

Mr. KAMMER. One said yes. It was interesting to note, however, that 3 of the negative respondents of the 13 also went on to say in very different ways that they suspected that the Government was not interested. They suspected that the Government was not serious about this proposal and since the costs of putting together a responsive answer were so high, they weren't interested in doing it now. If the Government showed more interest, they would show more interest. That was the essence of the message.

Mr. LUJAN. You discussed several things you would be taking into consideration in the bid: The various costs, what it would cost the Government if we didn't go ahead with it, what it will cost the Government if we do, those sorts of things.

In an earlier question today there was the question of recouping the investment; it said that it was in excess of $2 billion. My recol-

lection is somebody said $3 billion. We are looking in that general area. Is this part of the consideration?

My thought is they were talking about we don't charge the cancer patient for all the research. Within NASA we have all of the airplane research, we don't try to recoup that. That is technology to the manufacturers. I didn't see that in your list of costs of recouping——

Mr. KAMMER. One of the things that I intend to do is to try and get together a complete inventory of the equipment, of its acquisition cost, and a judgment by a private accounting firm as to its market value, using several techniques. I think the investment for the equipment is on the order of $1.6 billion, but I can give you numbers by perfectly credible people that are as high as $4 billion.

In any case, the Government built these systems for R&D purposes in a number of cases. We have gotten very valuable information out of them. Value has been returned for value invested.

In the case of the weather satellites, there has been tremendous operational value for the funds expended. It is not obvious that the acquisition cost is necessarily the right way to judge the situation. One could even go as far—I am not advocating this—but a logical case can be made that as the Government is likely, in the first instance, in the first few years to be the major customer of any system, land or meteorological, Government would be foolish to add equipment costs to the winner, since they will put a margin on top of it and charge it back to the government.

You might be better off deeding equipment over without receiving money. Maybe it would be better to make a commitment that the data would be provided to the Government for free. This is an open question. I don't have an answer.

Mr. LUJAN. I understand that.

I can understand your not having the answers. One that I wondered about, if we were to sell the weather satellites, can we get that information from military satellites?

Mr. KAMMER. There are differences in operational philosophy and then I think also the Department of Defense would probably have no desire to let other people know what they knew and when they knew it.

Mr. LUJAN. When a cyclone is coming, I suppose they can tell that. Why would they have any objection to sharing that with the general public, as we do with Metsat?

Mr. KAMMER. I think on a selective basis that might very well be possible, but the focus is different than forecasting in the United States, for instance.

Mr. LUJAN. Thank you.

Mr. VOLKMER. Mr. MacKay.

Mr. MACKAY. Thank you,

Dr. Kammer, Dr. Townsend gave, it seemed to me, some fairly rational suggestions for a framework within which we ought to look at this, and one of them was if you can't build competition in, then there is nothing inherently better about the private sector doing it than the Government doing it. In fact, all it really is, is contracting out a Government function. Do you agree with that?

Mr. KAMMER. Well, I think there are some other issues to be thrown into that. One is that in the case of Landsat the previous

administration and the current one have come to the conclusion that the Federal Government would not provide additional support to operating the Earth resources sensing system.

I wasn't a party to either of those discussions, but it is very suggestive, when two administrations with philosophies that are as separated as those two are, would come to the same conclusion. There is a good chance if the private sector is not willing to make some kind of an investment, that there will be no Landsat system. Perhaps you have had an opportunity to look at the Presidential decision memorandum. When the question was posed to the President, in fact, the two alternatives that were proposed to him were no Landsat or the possibility of a commercial Landsat along with the possibility of a commercial meteorological satellite system.

This seems over the last 5 years to be a pretty common thread in the analysis. I am not sure that the alternatives are quite as crisp as Dr. Townsend suggested. I wouldn't want to speak for him, but it is possible some people are also making the assumption that the Federal Government will make a continuing investment in Landsat, and the recent 5 years' debate doesn't suggest that that is so, or will be so.

Mr. MACKAY. So then you are suggesting that one viable alternative would be the alternative that OTA suggested, which is that we simply buy the data from the French or from whoever else develops it?

Mr. KAMMER. It could be. It depends on how valuable we conclude Landsat data is. There are a lot of expert scientists in the field who perhaps are also enthusiasts, at least that is an admissible point, who would suggest it has a high potential value. Its market value demonstrated over 11 years is less than modest.

There was some discussion of the Federal operating costs for Landsat. My advice from NOAA, I presume it to be accurate, is that they are incurring operating costs for Landsat that are $48 million per annum. The investment to date in Landsat 4 and D', which is on the ground, is $524 million. The actual sale through the EROS Data Center for last year for Landsat data was $2.9 million.

Now there is a research benefit that flows from this as well. But even with that in mind, it doesn't look as if the demand is increasing with a big appetite. Maybe that is because the Federal Government is an incredibly bad marketer. That is an hypothesis that should be tested.

There are other possibilities that are also logical, such as the demand isn't really there. If it is modest, if it isn't there, maybe there would be no harm in buying data from other countries. The French made a very strong commitment to the SST which in retrospect may not have been a brilliant commercial decision.

Mr. MACKAY. My understanding is that one of the really dramatic developments was the remote sensing device which is on the last of the statellites, which is only operated, say, maybe 6 weeks because of other equipment breakdown.

Mr. KAMMER. That is right.

Mr. MACKAY. So, now, that being the case, are you in a position yet to know whether there would be a market? I mean, is it fair to judge what they were able to do? It is true the programs have been

around 10 years? For one reason or another, 6 weeks of what was done is really the potential.

Mr. KAMMER. Well, I can make a couple of comments but unfortunately I can't give you a full answer. About 6,000 scenes were generated from the thermatic mapper. That is a lot of data and analyzing it will occupy our people for a number of years.

For purposes of geological applications, for instance, there is enough probably to test. For purposes of more transient interest, agriculture, for instance, certainly that is not enough, and more needs to be done. Landsat D', which is on the ground also has a thermatic mapper on it, and it is quite an impressive device. I am kind of looking forward to learning more about it. That satellite is rated to operate for 3 years.

If we had good fortune and in fact it did operate for 3 years, I believe that could provide quite a bit of testing.

Mr. MACKAY. You indicate that you want to be certain that you get the best deal for the taxpayer and that you are going to try to define a Government bid which I assume in sawmill language would mean a kind of a go/no-go, if you can't top this, it is not in our interest to go forward with any of the bids.

Mr. KAMMER. That is my thought, sir. Now, at least give the Secretary of Commerce a basis, a handle on that.

Mr. MACKAY. Should not that Government bid go out as part of the request for proposals so people could understand what it is you think would be a base line?

Mr. KAMMER. Yes, sir, it probably should. I hadn't thought about it.

I will have to give that some thought. It is a very appealing idea. It might also provide people with some kind of a signal as to whether they wanted to play the game. They might be able to avoid incurring the cost. I can't think of any reason why I shouldn't and some reasons why I should.

Mr. MACKAY. It would appear to me that if you don't do that, you are not going to get realistic bids, people are going to have to basically pad the bids.

Mr. KAMMER. Well, I had already intended to provide the product of the audit accounting study as an annex to the RFP. That provides some kind of base line, but it is not as good as what we were just discussing, which is kind of the next phase after you have your initial cost data; then you begin to think "What would it take to replace it, how valuable is this, would I bother to replace it, in fact?"

Mr. MACKAY. In fact, couldn't we go on in the process of doing that and develop a framework within which we can make this decision without going through the request for proposals?

Mr. KAMMER. I don't personally believe so. I obviously thought about this an awful lot. I am not insensitive to the conversations you all had with the Secretary and the written information that is on the record.

As far as I can tell, I have read every study that has been written in the past 5 years, and I have read them all pretty recently—retained what I am capable of retaining. They all seem to be sort of taking in each other's intellectual laundry.

Everybody has the same data set, then they write an essay. Now I don't want this to be taken as an unkind word, but there is a lot of speculation about what people are willing to do. There is always going to be. We are talking about something that is unknown, we are speculating about the future of a market that isn't developed.

The most hard-headed way of getting beyond that speculation, and the Secretary represented this more ably than I can, is to ask people to put down on paper what they would charge for providing the service, with the understanding that it is conceivable that we could take them at their word and sign a contract. It is asking the private sector, the industry, to make a judgment about the marketplace. Intuitively that seems like the best way of getting an estimate for the future.

Mr. MACKAY. I asked Secretary Baldrige, half jokingly, why we didn't do this same thing with the space shuttle program, put out a request for proposals and see if the private sector would take it over. And he said, well, I don't think that was appropriate. And I asked, how do you know without requests for proposals?

Does that dialog not reveal a flaw in this? Is it not possible that there would be a time when it is a premature decision? In other words, is it not possible that there are some interior questions that have got to be answered before you go through this?

I guess what I am saying is, is it not possible that you are putting on the private sector what is appropriately a public policy function?

Mr. KAMMER. Yes, sir; it could be. My assignment, as I understand it, is to evaluate the issue. I have been told the mechanism to do it, which is to run an RFP. I haven't been told that the answer has to be solid. And my understanding—this is reflected in my charter and my conversations with my bosses—is that the answer could be that this doesn't work. Maybe the answer is that it should persist in some other way.

Mr. MACKAY. Then you have no interest in it. I can't understand what you are saying. And yet, as a human being, you have a career interest.

Do you think that your career would be prejudiced if you came back and said this doesn't make sense?

Mr. KAMMER. Well,——

Mr. MACKAY. Do we have to play that game and we have to say that and you have to defend whatever happens?

Mr. KAMMER. Maybe it would be. Sure, it is an admissible point. I also might have a lesser opinion of myself if I said other than what was the truth.

Of the two, the one I assigned the higher value to is my own opinion of myself.

Mr. MACKAY. I appreciate the spot that you are in.

Mr. KAMMER. So do I.

Mr. MACKAY. Thank you.

Mr. VOLKMER. I have several questions. One is just a continuation of Mr. MacKay's question on the purpose of the Source Evaluation Board.

Did I understand you currently in saying that you, yourself, were to formulate the issues?

Mr. KAMMER. Well, I have been told what to try and find an answer to.

Mr. VOLKMER. Or to sell the satellites and the ground stations and to see if that can't be done?

Mr. KAMMER. It is not. I have not been told the answer to the question is that we must sell. I have been told to evaluate whether or not this can be done and to do it by producing an RFP, which requires me to in fact state an awful lot of the issues that are vaguely in the air, run the RFP and provide the information that results from that and forward it to the Secretary.

Mr. VOLKMER. In other words, at the end, totally, after the response to the RFP's come back, and yourself and the Source Evaluation Board make a determination that it isn't worthwhile, let's forget it; that is what the answer is going to be—is that what you are telling the people who are——

Mr. KAMMER. Yes, sir. That is not quite it. Can I say, a little differently, what I think the case is?

Mr. VOLKMER. Yes. I am trying to find out what we are doing.

Mr. KAMMER. Whatever conclusions I come to, whatever findings I have, will be presented to the Secretary, the selecting official, and ultimately made public without editing. That doesn't necessarily mean that other people will not comment on it and say the SEB has done a remarkably stupid job. It doesn't necessarily mean that the selecting official, the Secretary of Commerce, has to do what Ray Kammer and the group he is working with says. Those are not discretions that I have or should have, in my opinion.

The commitment to me is that the process will be done in a factual, logical way. No one will try and influence me in an improper way as to the answer, but they may ignore my answer.

Mr. VOLKMER. We could end up at the end of the process without ever submitting any legislation to the Congress whatsoever?

Mr. KAMMER. It is inconceivable, with all the stir that is going on, there certainly would not have to be a report to Congress.

Mr. VOLKMER. Not a request for legislation; we will proceed further?

Mr. KAMMER. Yes, sir. That is an admissible possibility, yes, sir.

Mr. VOLKMER. Now, the next thing I would like to know is, on June 9, the Department of Commerce notified the House and Senate Appropriations Committees of an intention to reprogram $1 million and 19 positions in NOAA and to establish a Source Evaluation Board.

Now, what do you intend to do if either committee denies the reprograming?

Mr. KAMMER. Well, I would be in a very tight position. Without money, I can't operate. And I suppose I would ask my boss—in this case, the Secretary of Commerce—what to do next.

Mr. VOLKMER. All right.

Now, back when Secretary Baldrige testified, I asked him specifically a question regarding the implication of the international agreements that we have and the meteorological conference that we belong to and everything, and I have yet to get a response to that.

Do you know any reason as to why I have yet to have a response, 2 months later?

Mr. KAMMER. Yes, sir.

Mr. VOLKMER. What is the reason?

Mr. KAMMER. We still don't know the answer. But I think we will have either an answer or a crystallization fairly soon.

Mr. VOLKMER. We are going to have to have an answer.

Mr. KAMMER. Of course.

Mr. VOLKMER. Before we go pretty far.

Mr. KAMMER. Yes, sir.

Mr. VOLKMER. Another thing, on another question that was asked on the commercialization and the timeframe in which it is being evaluated. And the two administrations on the Landsat—and we all know it was transferred basically to NOAA with the idea of going ahead with commercialization if at all possible—we didn't get into the weatherization until when?

Mr. KAMMER. My understanding is, that came up in the debates that immediately preceded the signing of the Presidential decision memorandum.

Mr. VOLKMER. It has been within this administration?

Mr. KAMMER. I believe so.

Mr. VOLKMER. That the proposal to commercialize the weatherization, at least I hadn't heard about it. I am not saying there wasn't discussion. It hasn't been publicly proposed?

Mr. KAMMER. Yes, sir.

Mr. VOLKMER. Now, another thing that concerns me about your statement—and others, too—was just your personal viewpoint; not your position. Do you believe that it is good for the national economy and for security and for the good of this country that we have a land sensing system of some kind?

Mr. KAMMER. Sir, I have to admit I am fascinated by the technology. I think it is kind of fun. The applications so far are very modest. Just looking at it as a newcomer coming in, it is not being used for critical applications that I am aware of now. It may be an imperfection in my understanding, or maybe I am right.

Mr. VOLKMER. In other words, if I get the gist of your thought, it is that the way it appears right now it wouldn't be too much cost if we did not and we had to purchase from other countries?

Mr. KAMMER. I wouldn't want to go that far. And the reason is—I think it is why people have enthusiasm for this and why I find it attractive—we are betting on the future. When NASA was rather heavily into the Apollo program, for instance, there weren't obvious economic benefits that were going to come out of that. I think, in retrospect, it is obvious the impact it had on the electronic industry and the impact it had on other industries in the United States was pretty fantastic. It may well be that remote sensing is of that character, too. That is why I don't think it should be dismissed out of hand. I think that is why others say let's work the problem some more.

The facts that are in hand today would not make a fantastic case to me.

Mr. VOLKMER. All right.

Mr. MACKAY. I would like to follow that up at an appropriate time.

Mr. VOLKMER. Right now.

Mr. MACKAY. Dr. Kammer, you just hit on the thing that has kind of been unstated and yet it bothers me very much. What you said is we are betting on the future. And I guess I would say the real question to me is whether this is basic research or whether it is now at a point where it is capable of being applied. And you are saying, "I keep looking and I can't find any evidence of applicability, although it is fascinating."

If it is in fact basic research, then the decision that the Government should pull out of this, because there is no commercial thus far market in it, would be almost the same as saying we are going to pull out of the medical research that is being done or we are going to pull out of the computer research that is being done.

Isn't that the underlying question, and doesn't your process beg that whole question? Some of us think it is basic research, and some of us think it is a major part of this country's, in essence, bet on the future, which is we are high tech, we have got leadership, we have invested heavily in leadership. And now, suddenly, for reasons which appear to me to be whimsical, one person out of the whole group said if you would put in something else, I would take this part of the basic research off your hands and would treat it like applied research.

Isn't that basically the question?

Mr. KAMMER. I don't believe so, but there are parts of what you say with which I know I strongly resonate.

Mr. MACKAY. Does your charter allow you to deal with that question?

Mr. KAMMER. Yes, sir. In fact, it is in our plan, as well.

Now, whether or not I have the imagination and capacity to deal with it adequately is an open question yet to be demonstrated. Yes, sir; it is part of my writ, in my opinion, and I have therefore put it in our plan.

It is interesting to note that the Landsat program from conception in 1972 was always discussed as a program about to be commercialized. It never happened, but it was always just around the corner.

Mr. MACKAY. So maybe it got sold wrong from that outset?

Mr. KAMMER. Conceivably. There are some applications right now that in my current level of understanding they don't appear to be unique. It is convenient given that a satellite is up. We spent over a half-billion dollars getting to that point, and you could imagine a lot of pretty brute force ways of getting some of that information that wouldn't approach costing half a billion dollars.

The fundamental reason why I think it has been pursued is that it advances a technology. I find that a very important issue and maybe the most important part of the whole thing. I am not sure yet, but I think that it has to be dealt with.

Mr. MACKAY. Thank you.

Mr. VOLKMER. I have several more questions. I will try to get through them as fast as possible.

In your statement at the top of page 3, you say a very important issue that we must resolve early is at what system level or component size we should scope the RFP.

At the bottom of page 3 and top of page 4, you say you have already, at least the way I read it, made a decision. and you do not

plan to allow separate bids on ground and space systems, only on the land or Landsat and Polar and geostationary.

Mr. KAMMER. The context of that, which starts on page 3, was meant to be a conditional statement, and I realized as I was reading through that it didn't come across that way. And you probably noticed in my oral statement I changed the wills and shalls to woulds and coulds to make them conditional.

The exact status of this concept is, last Friday, I discussed this with the Interagency Board of the Assistant Secretaries from the interested agencies. They agreed that it made sense, and my next stop is here. That was Friday and today.

Mr. VOLKMER. You agreed what makes sense?

Mr. KAMMER. They agreed that the concept as represented here was a sensible way to go.

Mr. VOLKMER. We do not look on Landsat to provide RFP for merely the land operations. With the Government still continuing the satellite and the value added services, no RFP on those?

Mr. KAMMER. That is what I have in mind. It is my responsibility to scope the RFP; it is not the Interagency Board's responsibility. And my next stop, as I said, was to come and present it to you and to try and elicit some comment.

Mr. VOLKMER. I am going to give you some comment right now. You have just seen some of the Members here and perhaps somebody ought to try and do a little bit of a whip count, maybe, among the Members of the House and Senate.

Personally, on the weatherization thing, I have heard more negative than positive of those who expressed an opinion. The next thing is that I do believe, personally, that the scope of the RFP should include the remote, with the possibility of Government continuing the satellites. If we do, we are going to have to get another one ready for a period that would eventually let the satellite system come within the private, also, because right now I think everybody, at least the information I have, pretty well agrees that the Landsat system by itself, the total, probably is not going to be economical for several years. But the land part, data part, and so forth, may.

Now, my present inclination is that if you go with your present RFP proposals on just the total systems, that you are going to find somebody that isn't going to be very sympathetic to you when you come back here. The reason for that—the second thing—is that I find that that is disturbing to me—yesterday as I go through your agenda—for the total thing, and then coming to Congress some time next year for legislation, I think you—again, the discussion here—you find that maybe we would be better to try and work some framework legislation beforehand, so that you may have some ideas and views of the Congress.

Right now, you are flying blind; we are, too. But I would hate to see you go all the way through this and come up here with a proposal and Congress turn you flat.

Wouldn't it be better if we could work up some framework legislation, including the weather satellites—I am willing to go that far—including them in the legislation as a part of the proposal, and let's find out what this committee feels and what the House and Senate feel, before you go through all of this?

Mr. KAMMER. In preparation for testimony today it occurred to me that the question might come up so I queried the system, the Department of Commerce, and asked my bosses what the position of the administration would be on that. And the fear at the moment is that if proceeding becomes contingent on framework legislation, that it is easy to imagine it being a very long time before we were able to proceed, and as I think the Secretary indicated at his hearing before this group, he feels very strongly that an RFP and a response to the RFP is the only thing left to do that will provide useful new information.

One probably will be in a much more sensible position to talk about what the elements of framework legislation might be——

Mr. VOLKMER. I am more than willing to discuss that.

Mr. KAMMER. One of the things said today, I think was said by everybody that has testified but me, and probably those that you will have testify later. A lot of people, have said and will say that there must be a Landsat, it is unthinkable that there not be a Landsat, and yet $2.9 million is all they got last year for a Federal investment that approaches $600 million right now.

I am not saying that proves there shouldn't be a Landsat, but even something as fundamental as whether or not the policy statement should say "straight ahead for Landsat," or "I am not sure, better think about it," is not that obvious. Most of the experts in the field would certainly tell you that it should say straight ahead. But there are some very vexatious facts that surround this.

With respect to your comment on the scoping, the three concepts that led me to that were, first of all, accountability. If we split the system below the level of say a Landsat or Polar or geostationary satellite system, suddenly someone else other than a prime contractor has to be in charge of coordinating the inferfaces. That is where all the operational trouble is going to come. That someone is going to be the Federal Government.

That is almost exactly what we have in place now as management structure. It would lead, I believe, to modest, if any, changes in what the Government does. Since the Presidential decision memorandum didn't contemplate that, I feel an obligation to pursue what I believe——

Mr. VOLKMER. Do you believe if the Government got out of all value-added service and got only to the raw data, and furnished raw data——

Mr. KAMMER. The activity and value-added data are outside of the use by the Federal Government. The Federal Government can provide for itself or can contract out as it chooses, and does. Both now are very modest. That may be where all the potential is ultimately, but they are very modest now. What I was proposing in the scoping concept was simple. This is me talking, not the Federal Government declaring it by any means, which it couldn't do without concurrence from Congress. What I am proposing is that the Federal Government ultimately declare that it won't compete in the value-added arena. There you have the ultimate form of competition. Everyone has the preprocessed data, the sort of raw data with the things in it that have to be useful, available to them at some fixed and equitable fee. Then they can do anything they want with it.

They can compete. To me that seems to create the highest potential for an open market, and it also answers another problem I worry about a lot. I think a lot of the three studies that were done at the request of Congress, one of the things they advocated was sort of the idea you would franchise the availability of the data, that was how one would get it developed. That bothers me in terms of background, just my own background, in that you have conferred value on the data not because of an intellectual accommodation to it but by making it exclusive.

The value is conferred by constraining it, by making it unavailable to a large group. The large group I worry about the most is researchers. If the preprocessed data, but not value added, are available to the researchers, they can do their own value added. In fact that is what their research is about. If it is constrained in the other way, where the preprocessed data become the franchise, it is hard for me to see how you can at the same time make that available to researchers while promising never to give it away.

I am sure you are familiar with the way data ebbs and flows and washes through a research community, and turns up in ways that seem to have nothing at all to do with the proprietorship.

I also worry about the technical feasibility. It is feasible, I believe, to separate satellites from ground systems and there are examples where parts of satellite systems have been split off—it is messy, it is operationally not good—but it can be done. I think it might generate added cost and it might threaten reliability.

There is a pragmatic concern that I have always had, and that is the SEB itself has to somehow constrain the number and format of the bids or it will never be able to evaluate the responses. This way of constraining is——

Mr. VOLKMER. I can see not taking RFP's from computer people or from tape people or anybody else as subcontractors under a system; when you take a total overall system, I think without, in order words like Landsat with the ground system, to me I don't believe that that would give you that many proposals that you are going to be overwhelmed.

Mr. KAMMER. The number of the proposals and the complexity of the proposals are both variable. The complexity is bizarre under the best of circumstances. Bizarre is a terrible word to use. Sir, if you were willing, I would like the opportunity perhaps in some other forum to give you and other members of the panel a briefing. It is very important to me to get this issue resolved because I can't proceed very intelligently until I do.

Mr. VOLKMER. Maybe that can be arranged. We have to hurry on here.

Have you had any instructions from the Office of Management and Budget as far as what should be included or not included in the RFP's?

Mr. KAMMER. I have had two communications from the office of Management and Budget. I won't call them instructions exactly but I will describe them.

Mr. Stockman sent a letter to the Secretary of Commerce—to which he has not responded, I believe—in which he suggested that the costs of the current system should be aggregated and the estimate of Federal willingness to invest in the system in the future

should be limited by whatever we are spending now. There is a staff response making its way through the system—I wouldn't want to disclose it until it is sent.

The second communication was a conversation in the Interagency Board meeting of—the date on that would probably be May 17, if memory serves, I am not certain—where a representative of OMB advocated that the RFP not be concerned with the possible needs of non-Federal users.

The position that I took then, and that is represented in the plan that I have, is that it is possible that the Interagency Board, whose assignment is to represent the Federal Government's interest, can take that position, but I would not be providing the Secretary of Commerce with an adequate job if I didn't tell him what all the players wanted or what their expectations were.

He can decide at this point to ignore their expectation, but he needs to know. I have included that in my plan and intend to pursue it this summer.

Mr. VOLKMER. Now, if the Federal data needs, according to what I guess it is, as I understand it is, from OMB, what the agencies are presently utilizing cover only half the cost of operating Landsat. What will happen then, how are you going to go along with OMB's instructions?

Mr. KAMMER. Well, I will observe that OMB's instructions could be viewed as inconsistent with the decision memorandum signed by the President, wherein it states, I believe, on the third page, that the first few years' costs of Landsat could be as much as $150 million a year in excess of current total costs, and the current total costs are far in excess of the cost of the data needs themselves.

I take the President's decision as pretty firm and unambiguous. I presume that is what will prevail.

Mr. VOLKMER. Now, are all your instructions contained in your charter?

Mr. KAMMER. All the ones that I am currently aware of. What I am trying to think of is an intelligent way to say when I don't have an answer, when something hasn't been anticipated, I can go to a management board chaired by Mr. Mossinghoff, who is acting deputy secretary, or I can go to the Secretary or go to the Interagency Board, depending on what is appropriate. I have in the past; I will in the future.

Mr. VOLKMER. Those are on unforeseen contingencies, things that come up?

Mr. KAMMER. Yes; I think there will be a lot of those.

Mr. VOLKMER. Are there any other documents that limit——

Mr. KAMMER. Yes, sir.

Mr. VOLKMER [continuing]. Your actions?

Mr. KAMMER. Yes, sir. In addition to the Presidential decision memorandum and the charter, I take the Secretary's testimony and the colloquy that he had with this committee as policy guidance. And in addition to that——

Mr. VOLKMER. What about the OMB instructions?

Mr. KAMMER. Well, I work for the Secretary and he will take a position on that.

Mr. VOLKMER. It depends on what the final answer of the Secretary is?

Mr. KAMMER. They are senior to me and they will work on it. In addition I have a document that instructs my membership on how to comport themselves.

Mr. VOLKMER. Since we have a copy of the letter of the Director of OMB to Secretary Baldrige, do you think it would be possible for us to obtain a copy of the response from Secretary Baldrige to the OMB?

Mr. KAMMER. I will request that. The Secretary decides on what the Secretary signs.

Mr. VOLKMER. I have no further questions.

Mr. MACKAY. Just one question. What are you going to do if Congress doesn't approve the million dollars? Are you then going to put out an RFP and require the bidders to put up their share of that cost? Would that not be an unsubsidized way to find out if there is any interest in it?

Mr. KAMMER. Well, what I am going to do is, I am going to ask the Secretary of Commerce. I will further observe that sort of ignoring the wishes of Congress on something so specific as that is something that an operating official does at his own peril. I would not foresee a long or pleasant future for anyone who did ignore it.

Mr. MACKAY. I just wonder if you feel that you would get any bids if they had to, in effect, as a user fee put up their cost of the whole evaluation process?

Mr. KAMMER. It is hard for me to see how one could sustain the appearance of not being influenced when you were being paid by bidders.

Mr. MACKAY. Well, that is an interesting idea.

If they all paid you the same thing, however, then there would be no influence.

Mr. KAMMER. There is another stakeholder in it, at least, and that is the public, if you will. And the picture of a situation where a group of probably large industrial firms were somehow compensating the Government to hand something over is unsavory. I don't think that that is an idea whose time has come.

Mr. MACKAY. But the idea of the Government putting something out for bids and then subsidizing the bid process is unsavory, also.

Mr. KAMMER. We are not going to subsidize the development of the bids by the bidders.

Mr. MACKAY. Just the evaluation of the bids?

Mr. KAMMER. Yes, sir. But we are the ones that asked the question in the first place. I think that is fair. And each of the entities that bids will have spent a substantial amount of money. Dr. Townsend was estimating a couple million dollars. I think that is reasonable. I believe that is a good estimate.

Mr. MACKAY. I think that is a good estimate, also. I just wonder if our subsidizing the process does not give the bidders an idea that it is going to happen?

Mr. KAMMER. Sir, I think——

Mr. MACKAY. I am saying you ought to have a clear understanding that one of the answers you could arrive at is "none of the above," and the way we are going about it it is quite clear to me that that is not one of the answers. And that is the question that is bothering Congress.

THE COMMERCIALIZATION OF METEOROLOGICAL AND LAND REMOTE-SENSING SATELLITES

HEARINGS

BEFORE THE

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT

AND THE

SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS

OF THE

COMMITTEE ON SCIENCE AND TECHNOLOGY U.S. HOUSE OF REPRESENTATIVES

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SUMMARY OF HEARINGS ON PROPOSED SALE OF U.S. REMOTE-SENSING SATELLITES

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SUMMARY OF HEARINGS ON PROPOSED SALE OF U.S. REMOTE-SENSING SATELLITES

I. INTRODUCTION

On March 8, 1983, President Reagan proposed transferring both civilian weather satellites and Landsat, the land remote-sensing satellite system, to the private sector. On April 14, June 21, June 28, July 14, and July 28, 1983, the Subcommittee on Natural Resources, Agriculture Research and Environment and the Subcommittee on Space Science and Applications of the House Committee on Science and Technology held joint hearings on this proposal entitled "The Commercialization of Meteorological and Land Remote-Sensing Satellites." The hearings focused on how this transfer might affect national and international interests (see Appendix A for witness list).

Secretary of Commerce Malcolm Baldrige and Source Evaluation Board chairman Raymond Kammer testified on the process which President Reagan's announcement set into motion. According to Baldrige, the President's decision was based on the theory that private enterprise is the driving force of the economy and that the Government should buy products and services from the private sector when the private sector can provide such products and services more efficiently. According to Baldrige, the Administration plans to issue a request for proposals (RFP) to generate the information needed to decide whether it is feasible to transfer weather satellites and Landsat to the private sector. The Administration believes that only with the RFP completed can answers be formulated to the many questions which have been raised on such issues as national security, Government and user costs, and system continuity.

Several witnesses from the private sector voiced the opinion that the risks involved in commercializing Landsat and weather satellites outweighed the possible benefits. Data users were concerned that the data would be less accessable or more expensive after a transfer. Others warned that a private

operator with a guaranteed contract would function as a monopoly which would restrict rather than encourage competition. The Department of Defense raised concerns about national security, primarily because of DoD's use of civil weather satellite data. The hearings raised many other questions, including:

- Is remote sensing a public good which should be provided by the Government?
- How would international cooperation in remote sensing be affected by selling the satellites?
- What will be the Government's role after the transfer and who will be responsible for advanced R&D?

II. BACKGROUND

Landsat is a remote-sensing satellite that returns data which can either be processed into images or utilized in digital form in geological exploration, agricultural forecasting, and other areas. Landsat was developed by the National Aeronautics and Space Administration as an experimental program, and, although the program was a technical success, no long-range plans were made to convert it to a more user-sensitive, operational system. The lack of Government commitment to long-range plans has suppressed the Landsat data market. In fact, current data sales do not come close to meeting procurement and operations costs.

In 1979, seven years after the first Landsat began returning data, President Carter transferred Landsat operations to the National Oceanic and Atmospheric Administration (NOAA) in the Department of Commerce. At the same time, he requested that NOAA study whether the private sector could operate a land remote-sensing system in the future. The Carter Administration planned to build and launch Landsat 4 and three follow-on satellites, effectively continuing Landsat as a Federal program through 1994. It was thought that a Government commitment to data continuity was necessary to encourage private sector investment in data interpreta-

tion, equipment, training, and long-range studies, and thus to increase the data market. The Carter Administration hoped that Landsat data sales would be large enough by 1994 to meet satellite procurement and operations costs and that the private sector would then be able to operate the system for profit.

The Reagan Administration also plans to transfer Landsat to the private sector, but it trimmed six years off the Carter schedule. The Reagan Administration currently plans to fund only one more satellite (Landsat 5), to be launched in early 1984. Landsat 4 is failing prematurely, but Landsat 5 is projected to last three years, which would continue the Landsat program through 1987. According to the Administration, the private sector is better equipped than the Government to expand the Landsat data market since it has both profit incentive and experience in marketing new products. If, however, the private sector does not take over Landsat, the program will end in 1987.

The Reagan Administration was the first to consider commercializing the weather satellites as well as Landsat. There are currently four satellites in the civil weather satellite system which are operated by the National Oceanic and Atmospheric Administration (NOAA). Two polar-orbiting satellites are in relatively low, near-polar orbits and provide whole-earth data for weather monitoring and prediction programs. Two geostationary satellites are in higher equatorial orbits, providing repetitive earth views for U.S. severe weather warning services.

The Federal Government uses 95 percent or more of the data from the civil weather satellites, with the National Weather Service the primary user. The Department of Defense is the other major user; data from the civil weather satellites frequently supplements the Defense Meteorological Satellite Program (DMSP). The United States exchanges weather data with over 120 other countries without charge in return for foreign ground-based data which are used for both civil and military

forecasts.

On July 13, 1981, President Reagan requested the Cabinet Council on Commerce and Trade, chaired by Secretary of Commerce Malcolm Baldrige, to assess: 1) the best mechanism for transferring Landsat to the private sector as soon as possible; and 2) if the weather satellites should be transferred at the same time. The Cabinet Council met to discuss these issues in December 1981, and in March and April 1982. According to Baldrige, the Council decided at the April meeting that the weather satellites should remain under the control of the Federal Government and that more study was needed to decide what to do about Landsat.

The Reagan Administration also formed several governmental and advisory groups to study the commercialization of Landsat and the weather satellites. The Landsat Remote-Sensing Satellite Advisory Committee, the Business Evaluation Committee and the Technical Evaluation Committee all evaluated responses to a request for information (RFI), which had been issued in September 1982 to solicit industry comment on the feasibility of Landsat and weather satellite commercialization.

The Land Remote-Sensing Satellite Advisory Committee, composed of individuals from outside of the Federal Government, recommended that the Government transfer only the space and ground segments of the land and/or weather satellites up to and including the receiving of raw, unprocessed data. Under this plan many firms would then enter the data processing, enhancement, and product development segment (data enhancement and product development are also referred to as the "value-added" segment) of the Landsat market.

Two Government interagency panels also evaluated the RFI responses. The Business Evaluation Committee concluded that the user market for Landsat is not presently large enough to support private operation without a Government subsidy. It therefore recommended a gradual commercialization, beginning with the value-added segment. The Technical Evaluation Committee raised several national

security concerns. The committee also concluded that one firm, operating both land and weather satellite systems, would have a monopoly that might harm Government concerns.

The Cabinet Council on Commerce and Trade met again on December 15, 1982, reversed its previous decision, and recommended the transfer of civil land, weather, and future ocean remote-sensing satellites to the private sector. The recommendation was then forwarded to President Reagan for approval. On March 8, 1983, President Reagan announced that he supported the Cabinet Council recommendation.

Following President Reagan's announcement in June, 1983, a Source Evaluation Board was formed to develop and issue a request for proposals (RFP). There are three committees under the Board which will provide: 1) a business evaluation; 2) a technical evaluation; and 3) legislation to submit to Congress once a final decision is made. According to the current schedule, the Source Evaluation Board will release a draft of the RFP in October, 1983 and invite industry and Congress to comment on the draft through mid-November. A final RFP will then be released in December, 1983 and industry will have two months to respond. Following a review of the proposals, the Board will send its recommendation, with the best offer or offers from industry, to the Secretary of Commerce. If the Board does not believe that any of the proposals from industry are acceptable, it can also recommend that no transfer be made. The Secretary of Commerce will then make his final decision, probably in May or June, 1984. Based on the final proposal, the Source Evaluation Board will draft legislation to pass through the White House and then to Congress. With Congressional approval, the satellite systems could then be transferred to the private sector.

Some Members of Congress are concerned that Congress will not have sufficient voice in the Administration's commercialization process. An amend-

ment to the Emergency Jobs Bill (P.L. 98-8) expresses the Sense of the Congress that Congress must approve the transfer, lease, or sale of U.S. civil remote-sensing satellites. Title II of the NASA FY84 authorization bill (P.L. 98-52) requires that Congress be notified of any recommended policies, procedures, conditions, and limitations for a transfer of civil remote sensing satellites. In addition, on September 19, 1983, Rep. Mike Andrews and Sen. Gorton introduced Concurrent Resolutions expressing the sense of the Congress that weather satellites should not be commercialized at this time. The Gorton Resolution passed the Senate on October 7, 1983, and the Andrews Resolution was reported by Subcommittee on October 20, 1983.

III. ISSUES

The five hearings encompassed the proposed commercialization of both Landsat and weather satellites. The proposal to transfer weather satellites has caused more controversy because weather satellite data affect the safety of lives and property. Thus, one portion of the hearings focussed on the question of whether meteorological satellites could be transferred to the private sector without jeopardizing their important services. Testimony on Landsat focussed on the size and nature of the Landsat data market and on foreign competition in land remote-sensing. In addition, data from both systems are utilized internationally, raising concerns about how the transfer would affect U.S. foreign relations. Other issues affecting both systems relate to national security, the possible creation of a monopoly, the need for Government oversight after a transfer, and the need for legislation. Issues of international competition and data continuity are, however, unique to Landsat.

This report does not discuss certain topics raised during the hearings, including personnel matters and specific commercialization proposals. For example, at the first hearing, Secretary of Commerce Baldrige revealed that Deputy Secretary of

Commerce Guy Fiske had recused himself from working on the commercialization issue because of a possible conflict of interest. Another witness, Mr. George Bennett (Grace Commission), suggested a Landsat pricing plan to help the Government determine the value of Landsat data. Under Mr. Bennett's plan, the Government would allow companies to bid for the right to price Landsat data and share any profits they made with the Government.

Discussion of eleven specific issues follows:

Issue #1. Should the United States have its own weather satellites? How important are the weather satellites and how would weather satellite data users be affected if the satellites were transferred to the private sector?

Witnesses generally agreed that the weather satellite program is invaluable and must be continued, either under Federal or private control. Secretary of Commerce Baldrige testified that the Administration would transfer the satellites only if there was a guarantee that the National Weather Service could continue to meet public needs. Secretary Baldrige emphasized that only the satellites would be sold; the Government has never considered selling the National Weather Service. According to Baldrige, if a transfer occurred, the National Weather Service would buy the data it needed from the private satellite operator and would continue to run its programs as before. In addition, the terms of a weather satellite contract would allow the Government to monitor the weather satellite system to ensure that the weather satellite services are adequate for Government needs. In sum, the Secretary of Commerce testified that, although the weather satellites are very important, they

could be transferred to the private sector without adversely affecting the nation's weather services.

Dr. John Townsend (Fairchild) testified that he was concerned that a transfer would interrupt the flow of weather information that is vital to the safety of lives and property, both in the United States and abroad. Dr. Townsend suggested that the Federal Government encourage private industry to provide value-added products and services for special users, but urged that the Government continue to control the meteorological satellite system and to provide general weather forecasts, watches and warnings free to the public. He also emphasized the Government's role in the international exchange of data. Dr. Townsend concluded that commercialization of the U.S. civil weather satellites would not be in the national interest.

Dr. Aksel Wiin-Nielsen (Secretary General of the World Meteorological Organization) expressed concern that the private sector would not be able to uphold data quality, in part because of the sophistication of today's satellites and computer data processing equipment. He felt that the receipt of raw data should not be separated from the final processing. According to Dr. Wiin-Nielsen:

> "There is a risk, there might even be a high risk, in separating the task of processing the raw satellite data for extracting useful information from the meteorological service, and this separation could seriously jeopardize the quality of the final product."

Dr. Wiin-Nielsen stated that U.S. civil weather satellite data are too important to the international community to take such a risk. The Secretary General also observed that the U.S. commercialization proposal is unique -- that all other weather satellites and weather services throughout the world are maintained by national governments.

Other aspects of weather satellite commercialization, including international cooperation, national security and cost are discussed below.

Issue #2. Should the U.S. have its own land remote-sensing satellite system? How important is Landsat and how would Landsat data users be affected if Landsat were transferred to the private sector?

The hearings revealed a wide range of opinion on the question of how important the Landsat program is to the United States. Secretary of Commerce Baldrige testified that the RFP process would determine if Landsat has any economic value. Baldrige also stated that there is a general consensus that it could be eight to twelve years before Landsat is profitable and that, because of this economic uncertainty, industry may not want to have anything to do with operation of Landsat; in fact, he stated that the weather satellites were offered along with Landsat in order to make the commercialization more feasible.

Mr. Raymond Kammer (Source Evaluation Board) testified that both the Carter and Reagan Administrations concluded that the Federal Government could not continue to support the land remote-sensing system. Mr. Kammer

did not, however, mention that the Carter Administration had made a commitment to Landsat through 1994 while it studied the feasibility of commercializing the system. The alternatives put before President Reagan were more restricted -- either to end the Landsat program or to commercialize both Landsat and weather satellites. Thus, under the Reagan proposal, if the private sector does not invest in Landsat in the very near future, the U.S. land remote-sensing capability will end shortly.

When questioned whether the United States should have its own land remote-sensing system or should buy land remote-sensing data from another country, Mr. Kammer replied:

> *"It depends on how valuable we conclude Landsat data are. There are a lot of expert scientists in the field who perhaps are also enthusiasts . . . who would suggest it has a high potential value. Its market value demonstrated over eleven years is ... modest."*

He concluded that either the Government is a very bad marketer or that the demand is not really there; if the market is really as small as it now appears, then the United States could easily buy what land remote-sensing data it needs from the French after they launch their "Spot" satellite. Mr. Kammer also stated that, although the technology might have future value, Landsat data currently have limited applications; the best way to get an estimate of their future value is to ask industry to judge the future market through an RFP.

Mr. Richard Frank (former Administrator of NOAA) also testified that the

United States must decide how important Landsat data are, and whether we as a nation would be willing to depend on other nations for such data. Frank believes that if the United States is going to have a Landsat system, it should support it strongly; the present system is being "starved" by the Office of Management and Budget, which is denying data continuity to Landsat users. He stated that if no company bids on Landsat, the Government would interpret that as a lack of demand for the data. However, it might also mean that the Government itself is the market. Mr. Frank concluded:

> "We are a wealthy country and one that is technologically most advanced. And I think we ought to keep that technological advantage in as many areas as we can . . . If we are talking about budget priorities, however, I think this is an area where it is possible not to have a Landsat system. If the Japanese and French are going to have systems, and if we can get their data, I think its possible for us not to have one. Not preferable, but possible."

Other witnesses testified that more time is needed to develop a data market before land remote-sensing can be successfully commercialized. Dr. John Townsend (Fairchild) stated that, although the Government is the only significant customer at present, there is a small, emerging data market. According to Townsend, the Government should first commercialize the data handling and value-added portions of Landsat and in later years commercialize the space segment of the system. Senator Larry Pressler testified that the United States has invested years of research and

development in the Landsat program and should continue to lead in this technology. He does not believe that the U.S. should hand over its data market to foreign competitors.

Issue #3. Do remote sensing data constitute a "public good" which should be provided by the Government?

Since President Reagan proposed selling civilian weather satellites, there has been considerable discussion about whether the National Weather Service represents a public function that should remain entirely in the Government. Secretary of Commerce Baldrige testified that there are no plans to commercialize the National Weather Service, which provides a public service in its issuance of general weather forecasts, watches, and warnings. The weather satellite system, however, is organizationally separate from the National Weather Service. If the weather satellites were sold to the private sector, the Government would purchase the data that the National Weather Service requires to continue its service. Mr. Baldrige believes that the weather satellites could be commercialized without affecting the public's welfare.

However, Mr. Richard Frank (former Administrator of NOAA) testified that the Government should continue to operate the weather satellites because they support a public function in the United States as well as in over 100 countries around the world. Furthermore, according to Mr. Frank, the Government is not only the largest user of weather satellite data, it also is doing an excellent job of operating the satellites. Mr. George Bennett (Grace Committee) also testified that weather satellite data are a

commercial good and that the Government should continue to support the weather satellites.

Major General Earl Peck (U.S. Air Force) agreed that operation of the weather satellites is an important Government service and sees no reason to justify changing that operation:

> "I would regard the weather system that we now have as a sort of natural monopoly practiced by the Government to provide health, safety, and welfare. I cannot see any good reason for transferring the metsats to the private sector."

According to Dr. John Gibbons (Office of Technology Assessment), Landsat data might also be considered a public good. Unlike weather satellite data, though, land remote-sensing data are not vital to public safety and therefore not as critical as weather satellite data. Moreover, as Mr. William Spann (Metrics, Inc.) testified, the Government could buy land remote-sensing data from a private sector operator or a foreign satellite operator and continue to offer a public service by providing those data at subsidized rates to users. Mr. Spann did not address the possibility that foreign data might be copyrighted and more expensive than current Landsat data, thus limiting U.S. Government distribution.

The U.S. Government is currently both the producer and major purchaser of Landsat data. By keeping the price of data artificially low, the Government has for 11 years provided a public service for Landsat data users. Mr. Joel Greenberg (Econ, Inc.) argued that the Government should

continue to develop Landsat technology for the benefit of the country:

> *"Looked at in terms of maturity of U.S. technology and use, remote sensing from space is in its infancy, and without some nurturing by the Government, there is real danger that a land remote-sensing system summarily handed out to the private sector might collapse totally to our national detriment."*

Furthermore, Greenberg recommended that data should be available to the widest possible group of users, even if that means government subsidies. He testified that the long-term development of land remote-sensing data is in the public interest.

Issue #4. How important is Landsat data continuity? How will a transfer affect data continuity and user interests?

Landsat was developed as an experimental satellite with no long-range plan for an operational program. Currently, the Federal Government plans to launch only one more satellite (Landsat 5) in the Landsat series. The uncertainty over the future of Landsat, (and, therefore, over continuous data availability) has prevented a more extensive use of Landsat data by many current and potential users.

The witnesses generally agreed that Landsat does not currently have a large enough data market to meet procurement and operations costs. Several witnesses testified that the uncertainty about Landsat's future and data

continuity are hampering the Landsat data market. Dr. Thomas Lillesand (American Society of Photogrammetry) testified that:

> "It is not really a surprise that current potential users are reluctant to make large investments in equipment, training, and change of modus operandi if there is no guarantee that the data are going to be generated in the future."

Dr. Lillesand described Landsat as a relatively immature technology which has not been completely reliable or user-responsive.

Mr. Richard Frank (former Administrator of NOAA) testified that the Landsat market is small in part because the Government does not know how to market the data. According to Mr. Frank, the Carter Administration planned to build three follow-on satellites to Landsat 4 based on the belief that within 10-15 years the data market would develop sufficiently to support Landsat in the private sector; asked to explain the Carter Administration's philosophy, Mr. Frank stated:

> "But basically the answer was we were obligated to continuity of data, and we would have gone as far as we had to to have continuity of data--reliable continuity."

Secretary of Commerce Baldrige did not testify directly on the subject of data continuity. He did, however, testify that the most important element needed to develop a strong Landsat user market was an effective private-sector marketer. Baldrige stated that the private sector is better at

marketing than the Government and that the Landsat market should be developed at the risk of the private sector, not at the risk of the taxpayer.

Issue #5. How would transferring weather satellites to the private sector affect international cooperation in weather data exchange? How important is this data exchange to the United States?

The hearings emphasized the importance of continuing the international exchange of weather data. The United States provides weather satellite data without charge to foreign countries in exchange for data from their ground-based stations. Specifically, foreign data are utilized by both civil and military agencies of the U.S. government, while over 120 countries receive data directly from U.S. civil weather satellites.

Secretary of Commerce Baldrige testified that the Federal Government currently participates actively in the international exchange of weather data and that the transfer of the satellites to the private sector would not affect that exchange. According to Baldrige, the requirements for the transfer would ensure that the United States would continue to share data internationally, both through the World Meteorological Organization and through direct broadcast from satellites. Baldrige explained that the Government could purchase weather satellite data from the private operator and provide it to the international community, but he was not certain how to provide for continued direct broadcast to other countries.

Several witnesses expressed concern that a private firm operating the weather satellites might begin to charge other countries for these data. Dr. Wiin-Nielsen (World Meteorological Organization) testified on the importance of free international exchange of meteorological data to the United States and to the world. According to Dr. Wiin-Nielsen, each member country of the World Meteorological Organization plays an important role in the international exchange of data, and:

> *"It is clear that when one country considers changes to the meteorological satellites, it is necessary to also consider how such changes will affect the rest of the world. If one is considering changes which could lead to a departure from free, and I mean cost-free, access for all to satellite data, it could have very strong repercussions throughout the meteorological global system. Indeed such a change could deal a severe blow to the whole internationally accepted basis for no-cost meteorological data exchange."*

Dr. John Townsend testified that the proposal to sell the weather satellites had already caused widespread concern throughout the world and could undermine U.S. progress in international cooperation in other areas.

Issue #6. How would transferring Landsat to the private sector affect U.S. international relations, particularly with those nations which have used Landsat data?

The existing Landsat system has encouraged other countries to use land

remote-sensing data; foreign users can either receive the data directly from the satellite at a foreign ground station built in cooperation with the United States or they can purchase the data directly from the U.S. There are ten ground receiving stations world-wide, and two additional stations are planned. Foreign users who have invested in facilities and training are concerned that private operation might change their ability to make use of land remote-sensing data.

Dr. John Gibbons (Office of Technology Assessment) explained in his testimony the importance of continuing the U.S. policy of supplying data to any nation that wishes to purchase them. According to Dr. Gibbons, this "open skies" policy has been an important factor in the ability of the United States to operate Landsat openly and successfully in the world community. Developing countries have historically been concerned that Landsat data might contain valuable economic or military information which could be used against them. Under the present policy, developing countries have found it in their own best interest to purchase and use the data themselves and have come to accept Landsat:

> "Other countries are well aware that the possession of remotely sensed data and the ability to analyze those data gives others power to affect their own resource development. Private operation of the system could heighten suspicions that such data would be used to gain competitive advantage or that data on crop conditions or military activities might be sold preferentially to political or economic adversaries."

Dr. Gibbons testified that the U.S. policy of open distribution of data is based on the United Nations' doctrine of the international free flow of information. Any departure from that practice would be protested in the United Nations.

Mr. Robert Porter (EarthSat) also testified on the government's open data policy. According to Mr. Porter, the private sector is much more likely to emphasize secrecy in order to protect markets and patents. He pointed out that there are no treaties which ensure non-discriminatory availability of data, and that as land remote-sensing technologies improve, there will be more incentive to make the data proprietary.

Dr. Gibbons also pointed out that all of the foreign ground stations are government-owned and operated and have been built and operated under agreements with the U.S. Government. In his opinion, Federal oversight would be required to ensure that any private operator would continue to honor both these agreements and all international space treaties.

Issue #7. How will international competition in land-remote sensing affect a transfer?

France is planning to launch SPOT, a land remote sensing satellite, in 1985. Japan is developing a remote-sensing satellite for oil and mineral exploration, and the European Space Agency plans to launch an ocean resources satellite in the late 1980s. Without a strong commitment to a future land remote-sensing program, the United States will likely lose some or all of its foreign and domestic market for land remote-sensing data to

the French, who are marketing vigorously and have strong government support behind the SPOT system.

The United States needs to retain its technological lead in land remote-sensing, according to Secretary of Commerce Baldrige, but the key to competing with the French is effective marketing. French satellites will be technically more advanced in some ways than Landsat, and both countries will market their data in the United States (the French are already using a private company (SPOT Image) to market their services). Secretary Baldrige expressed concern that the French might uncover new markets which will shape their future technological development. Meanwhile, he continued, the United States is not marketing Landsat data effectively because the Government is not a good marketer. He stated that the U.S. private sector is more capable of competing with international land remote-sensing systems than is the U.S. government.

Dr. John Gibbons (Office of Technology Assessment) testified that SPOT will be competing with Landsat and may have some advantages over a private Landsat operation. He described SPOT as a subsidized, commercial, land remote-sensing system that will be simpler, cheaper and in some ways more capable than Landsat. Dr. Gibbons also testified that other countries are planning to build remote-sensing satellites as an important step in their space programs. He concluded that other nations are no longer willing to depend on a U.S. commitment to land remote-sensing but are instead making the commitment themselves.

Dr. Gibbons pointed out that the French system is designed to

be complementary to the Landsat system. If, however, the Landsat system is not continued, the United States will have to buy land remote-sensing data from foreign sources. Dr. Gibbons raised the question of whether Federal agencies will be allowed to purchase data from these foreign systems.

Issue #8. How do national security concerns affect the possibility of transferring Landsat and the weather satellites to the private sector?

The Federal Government has established limits on the sensing parameters of remote-sensing satellites to ensure that these satellites do not disclose sensitive military information. The Defense Department has also voiced concern about transferring civilian weather satellites, primarily because of the relation of these satellites to the military weather satellite system. The civil and military systems frequently exchange data, and civil weather satellites have served as a back-up in the past to military weather satellites.

As several witness testified, many specifications will have to be included in the request for proposals (RFP) to ensure that national security requirements are met. A commercial operator would be required to give priority service to the Department of Defense or even transfer the satellites to the Department of Defense during a national emergency. A private operator would also be required to deny data access to hostile powers in times of crisis. Government oversight would probably be required, for both new and existing sensors, in order to monitor spatial resolution, spectral resolution, geographic coverage, and speed and timeliness of data dissemination. Secretary Baldrige testified that the

Department of Commerce is actively conferring with the Department of Defense and the Director of Central Intelligence and that all such requirements will be met before a transfer is made.

Dr. John Gibbons (Office of Technology Assessment) testified, however, that it would be difficult both to resolve national security and international issues and to have a feasible commercial system. Dr. John Townsend (Fairchild) testified that all these issues should be resolved before the RFP is issued or many firms will not want to respond with proposals.

Issue #9. If the government awarded a contract to one company for one or both systems, would that company have a monopoly on the system's data market? How can competition be ensured?

The Source Evaluation Board assumes that after it issues the RFP, it will receive many proposals from industry from which to choose the best bid or bids. To date, however, COMSAT is the only company that has developed a detailed plan for commercialization, and it is still unclear whether enough other private firms will be interested to ensure a competitive process. Secretary of Commerce Baldrige has taken the view that issuing the RFP is the best way to find out which firms are interested.

The RFP process, however, does not address the question of competition after transfer. Some witnesses argued that competition after the transfer would be diminished or even precluded if the satellite systems were

transferred to the private sector with a guaranteed government data contract or subsidy. If the Government is committed to buying data from one operator, then other firms will find it difficult to enter the market.

Several witnesses agreed that Landsat would need a Government subsidy until the land remote-sensing market grows enough to be self-supporting. The Secretary of Commerce in fact testified that weather satellites were included in the commercialization proposal primarily to provide a revenue base for a private Landsat operation. Two witnesses, however, disagreed with this approach. Mr. William Spann (Metrics, Inc.) and Mr. George Bennett (Grace Committee) both testified that the land remote-sensing data market has great growth potential, sufficient in the long run to support several satellite systems. Mr. Bennett testified that several firms might ultimately develop and launch satellites to meet specialized data needs:

> "I think that like other markets, there will be a natural tendency for segments to emerge and for specialized satellites, with special purposes, to be put into orbits to serve special constituents."

Mr. Raymond Kammer (Source Evaluation Board) noted that foreign systems would provide competition for any private land remote-sensing operation supported by the U.S. government.

Ms. Kathleen Bennett (NASA) testified on the possibility of a private monopoly developing around a guaranteed Government data contract. As chairwoman of the Business Evaluation Committee (BEC), she reviewed all

responses to the request for information (RFI) issued in November 1982, including COMSAT's commercialization plan. COMSAT's plan includes a requirement that the U.S. Government purchase all of its data from the bidder for 15 years. The BEC asked the Department of Justice to review COMSAT's plan, and according to Ms. Charles:

> "The Department of Justice considered this to be a special advantage to that single entity which would in fact discourage competition. This would preclude purchase of data from other U.S. commercial entities or from other foreign systems, which could be very disadvantageous to those competing sources.

Major General Peck (U.S. Air Force) also expressed concern that it would be difficult to write a long-term contract with a single operator assuring that the Government would benefit from any future R & D developments in sensor technology. Dr Townsend (Fairchild) also testified that the "winner" of the RFP will hold a monopoly which could increase government costs. Mr. Robert Porter, (EARTHSAT) commented that the "winner" of the RFP should not be permitted to enter the "value-added" market. If it were allowed to do so and if it had special access to data, the satellite operator might enjoy an anti-competitive edge over its competitors in the value-added industry.

Issue #10. What should the Government's role be after the transfer of Landsat and the weather satellites? What costs and risks would be acceptable?

The Federal Government currently represents 25 percent of the data market

for Landsat and over 95 percent of the data market for weather satellites. As a major user, the Government may want to continue high-risk research and development in order to keep the United States competitive with other countries and in order to meet changing Government data requirements. Secretary of Commerce Baldrige testified that the Government would have the responsibility for monitoring satellite systems to ensure that new technology is used to meet Government requirements:

> "Also, the RFP should clearly provide for our ability to monitor the fact that the whole process, both weather and land, is keeping up to the state of the art, so that we just do not stand still. As the state of the art improves and the market improves, we would expect to see the services improve also, as they have been doing in the past."

Several witnesses expressed the opinion that the Government should continue long-term, satellite research and development. Both Ms. Kathleen Charles and Mr. Richard Frank cited communications satellites as an example of a U.S. industry which lost some of its ability to compete internationally because of the private sector's unwillingness to finance long-term, high-risk R & D (NASA has recently decided to re-enter the field of advanced communications satellite R & D in order to keep the U.S. competitive in this field). Ms. Charles suggested that a contract with a private remote-sensing satellite operator should provide for continued Government R & D. Ms. Charles and Major General Peck both thought that the private operator should also be required to fly experimental Government sensors on its operational satellites, should the government wish to do so.

Mr. Richard Frank emphasized that the cost of a continued Government remote sensing R & D program ought to be included in the consideration of any transfer proposal.

Mr. Raymond Kammer (Source Evaluation Board) testified that the transfer should be a good financial deal in comparison with the cost of the present system. This financial evaluation will be performed by the Source Evaluation Board in its comparison of industry proposals with a "Government bid." Mr. Kammer explained:

> "This bid will be developed after careful evaluation of Government assets, the current cost to the Government of maintaining and operating each system and the requirements of mission agencies like the National Weather Service. As Secretary Baldrige discussed with you, this sale should be a good deal for the American taxpayer."

Dr. John Townsend testified, however, that strict Government oversight would be required, based on his belief that a private Landsat or weather satellite operator would have a monopoly on markets. Without competition, according to Townsend, the private operator would be less efficient than the Government and product prices would go up:

> "This statement will probably be viewed as heresy by my industrial colleagues, but the real forcing function for increasing industrial productivity and efficiency is competition. In a sole-source situation, the only management motivation is to

increase profits as far as possible until checked through regulation or negotiation."

Issue #11. Is legislation needed to guide the commercialization process? If so, what provisions should it contain?

Any transfer of weather or land satellites to the private sector must be approved by Congress, and the Administration plans to draft legislation once it has decided to accept a proposal or proposals for the satellites. Many have argued that legislation should be passed prior to the proposal and bidding process, so that Congress could establish at an early date the policy guidelines underlying the transfer of the satellites.

In fact, even Secretary of Commerce Baldrige stated that introduction of legislation before the RFP process would alleviate some industry risk. It has been estimated that a company might have to spend several million dollars just to bid on the system and that some firms would be reluctant to spend that much money without knowing whether Congress would ultimately support the transfer. As Dr. Townsend (Fairchild) stated, "nobody in his right mind would bid" with the unresolved questions that remain about the transfer. Both Mr. Porter (EarthSat) and Mr. Spann (Metrics, Inc.) agreed that passage of supportive legislation before the RFP process would encourage industry to respond to the RFP. Mr. Rayond Kammer (Source Evaluation Board) indicated, however, that he is confident that industry is interested in bidding on the satellite systems with or without prior legislation.

APPENDIX: WITNESS LIST

April 14, 1983
Hon. Malcolm Baldrige
Secretary of Commerce

June 21, 1983
Dr. John H. Gibbons, Director
Office of Technology Assessment

Dr. John W. Townsend, President
Fairchild Space Company

Mr. Raymond Kammer, Jr., Deputy Director,
National Bureau of Standards, and
Chairman, Source Evaluation Board on
Civil Space Remote Sensing

June 28, 1983
Hon. Larry Pressler (R.-S.D.)
U.S. Senate

Panel: Mr. Joel S. Greenberg, Vice-President
Econ, Incorporated

Mr. J. Robert Porter
Earth Satellite Corporation

Mr. G. William Spann, President
Metrics, Incorporated

July 14, 1983

Mr. George B. Bennett
Braxton Associates and
Member of the President's Private Sector Survey
on Cost Control (the "Grace Commission")

Panel: Major General Earl G. Peck, USAF
Director, Intelligence and Space Policy and
Chairman, Technical Evaluation Committee

Ms. Kathleen Charles, Deputy Comptroller
NASA Goddard Space Flight Center and
Chairwomen, Business Evaluation Committee

July 21, 1983

Dr. Aksel C. Wiin-Nielsen, Secretary General
World Meteorological Organization

Richard Frank, Esq.
Wald, Harkrader, and Ross and former Administrator
National Oceanic and Atmospheric Administration
Department of Commerce

Dr. Thomas M. Lillesand
American Society of Photogrammetry and
Professor, University of Wisconsin-Madison

THE COMMERCIALIZATION OF METEOROLOGICAL AND LAND REMOTE-SENSING SATELLITES

THURSDAY, APRIL 14, 1983

HOUSE OF REPRESENTATIVES, COMMITTEE ON SCIENCE AND TECHNOLOGY, SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT, AND THE SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS,
Washington, D.C.

The subcommittees met, pursuant to notice, at 9:36 a.m., in room 2318, Rayburn House Office Building, Hon. James H. Scheuer (chairman of the Subcommittee on Natural Resources, Agriculture Research and Environment) presiding.

Present: Chairman Volkmer of the Space Science and Applications Subcommittee, and Representatives Fuqua, Scheuer, Winn, Bateman, Andrews, Schneider, Lujan, MacKay, Harkin, Chandler, Walker, and Lewis.

Mr. SCHEUER. Today the Subcommittees on Natural Resources, Agriculture Research and Environment and Space Science and Applications will begin a scrutiny of the administration's expressed intention to transfer Landsat and the weather satellites to the private sector, and we are delighted to have the Secretary of Commerce here to give us some of the background on that decision and some of the implications of that decision.

I would first like to recognize the distinguished chairman of the full Committee on Science and Technology, the gentleman from Florida, Mr. Fuqua.

Mr. FUQUA. Thank you very much, Mr. Chairman and Chairman Volkmer.

I want to commend both of you for holding these hearings because I think it gives us an opportunity to better understand and have a better perception of what the administration has in mind, and we have no better person here today than the Secretary of Commerce to present the administration's proposal for transfer to the private sector of our civil remote-sensing satellites.

There's been a great deal of comment on the matter in the press, and I think probably a great deal of confusion, Mr. Secretary. Today we have a chance to set the record straight and begin the process of moving constructively ahead toward the resolution of the issue.

The Committee on Science and Technology has been involved in this issue for some time. For example, in 1977 we had a report on the Earth Resources Information System and we recommended

that the Government commit to a 5-year Earth Resources Information System validation program with a stated goal of an orderly transition to an operational system. The same report also recommended that various institutional alternatives, including private sector ownership and operation, be considered. We also recommended that the executive branch should study and recommend to the Congress a pricing policy which encourages a competitive ground operation and encourages market development.

In 1981 a report entitled, "Civil Land Remote-Sensing Systems," the committee recommended that NOAA carefully assess the feasibility of private sector operation of both weather satellites and land remote-sensing satellites.

The point of this is to indicate that this committee has rather clearly seen the potential value of bringing the strengths of the private sector to our civil land remote-sensing activities. However, that does not mean that we have no further interest in the matter.

For example, we want to look very closely at any continuing obligations which the Government might incur in such a transfer, and we want to examine what subsidies, if any, would be required and for how long.

Mr. Secretary, we certainly want to welcome you and we look forward to your testimony. I might say that the Department of Commerce and NOAA have been most cooperative in recent weeks in trying to keep me informed of what their intentions are. It was not their intention summarily to sell off all of the satellites and sensing devices that we have, but merely to explore that possibility. I hope that this hearing will give you an opportunity to further explain your intentions and also allow expression of the concern that the Congress has including our feeling that at some point in time we must be involved in this decision.

We are very happy to welcome you here today, Mr. Secretary.

Mr. SCHEUER. Thank you, Mr. Chairman.

We will now hear from the ranking minority member of the full committee, Mr. Larry Winn of Kansas.

Mr. WINN. Thank you, Mr. Chairman.

I, too, want to thank you for the opportunity to welcome our distinguished witness today, the Secretary of Commerce, Mr. Baldrige. I think it is indicative of the importance of the issue that we are discussing today that we do have the Secretary of Commerce himself here to testify and explain the administration's views on the subject.

Mr. Chairman, it is obvious that the issue of commercialization of the Landsat and the meteorological satellite systems is an important topic, both to this Congress and to the Nation. I think it is equally obvious that over the past several months there has been a great deal of misinformation floating around in the media on this issue, as the chairman of the full committee just stated.

If we were to believe some of the press reports, as far as the administration goes, the issue is already cut and dried, and Congress would have no role in whether we ought to commercialize the satellite systems. However, I believe that the membership of both of the subcommittees participating today know that this is not the case. Furthermore, I think it is an excellent idea that the Secretary

is here in a public forum to explain just what the proposed steps are in this process.

I know that I have not made up my mind on the issue, and I truthfully believe that it will be some time before any Member will be able to completely evaluate with any degree of wisdom the merits or the demerits of the proposal.

Mr. Secretary, we welcome you here today. We look forward to your testimony. We certainly hope that you will use this opportunity to fully explain the administration's position and time table on this issue and dispel many of the myths that we and the public are hearing and reading about.

Thank you, Mr. Chairman.

Mr. SCHEUER. Thank you, Mr. Winn.

Mr. Secretary, in connection with the basic policy decision to transfer Landsat and the weather satellites to the private sector, President Reagan announced his intention of doing that on March 8 of this year. He added that it was his intention to solicit bids from industry to effectuate this policy decision, either to solicit single bids for the takeover of the entire system or bids for the individual land or weather satellite systems. This is a decision that we will be exploring in the course of this hearing today and other days.

As I mentioned, Congressman Volkmer and I are conducting a series of hearings that we will jointly chair, alternating, to go into every aspect of this decision.

We need to know that any plan for the transfer meets the needs of our national security and controls the availability of this data to a foreign power that might threaten us. We need to know that it meets the needs of our foreign policy. A hundred and twenty nations, particularly developing world nations, are receiving the weather satellite information as perhaps their best source of knowledge as to when to plant their crops, when to irrigate, when to harvest their crops, when to fertilize. I think there are clear foreign policy considerations in the insecurity and anxiety that these nations would suffer regarding the continuity of this information and perhaps the cost of this information.

We need to know the implications of such a decision to our domestic users, the radio and television stations that give weather information to the public; the newspapers that give it to the public; and the various commercial users such as the citrus industry that we heard from the week before last in Florida. That industry is in a state of great agitation about the prospect of the transfer of these two things.

We must make sure that there is a competitive environment in which these bids are taken and that the bidding process is not skewed so that there is a sweetheart relationship between the Government and any one particular firm in the private sector which, in effect, would exclude the participation of many middle-sized companies that are doing extraordinarily creative work in this field.

We want to look into the process by which these decisions are made.

Frankly, at this point—on the day that you are appearing here—we would have to state that we are disappointed that we do not

have as yet any workmanlike proposal, anything that would constitute a feasibility analysis that a businessman would want in making a major decision about a multibillion dollar merger or acquisition or trade or corporate arrangement.

There has been nothing that would constitute a study on the cost-effectiveness of this operation. There is nothing that would indicate that it is going to be beneficial to the taxpayers. I presume that one of the benefits of transferring these two systems to the private sector would be that the private sector is more efficient and that it can get the job done in a manner that is going to save the taxpayer money. We have not seen a shred of evidence of this.

Therefore, we are concerned about how this decision has been made.

A year ago, in April 1982, your own Cabinet Council on Commerce and Trade, chaired by yourself, concluded that "Weather satellites should not be transferred to the private sector." Now 8 months later that decision apparently was reversed, even though neither the Cabinet Council nor any of its working groups had met in the intervening period.

In fact, if one examines the advice which the Administration received during this period of time, it is almost inconceivable to me that the decision to commercialize weather satellites could have been reversed at all.

To be specific, during this period 13 of 14 industry respondents to the Commerce Department's request for information did not endorse sale of weather satellites.

The Commerce Department's Land Remote-Sensing Satellite Advisory Committee concluded:

> There is only a small commercial opportunity associated with weather satellites. Weather satellites were judged to be inherently governmental.

A joint Department of Defense-NASA study concluded, and I quote:

> There is considerable policy, financial, and program risk to the Government in commercializing weather satellites, and there is no clear policy or financial benefit to be realized.

Only just last week, even after that April 1982 decision had been reversed by your Cabinet Council, even though none of the constituent elements seemed to have reconsidered the decision, even after all of that, just last week, the President's Private Sector Survey on Cost Control, in the so-called Grace Report, concluded that:

> The concept of commercializing land-sensing satellites and weather satellites as a package should not be pursued.

Additionally, just this month, three congressionally mandated reports reached the same conclusion. The EarthSat Corp. said that: "operating losses would continue" under commercialization.

The National Academy of Public Administration concluded that commercialization "fails to meet sensible criteria of preserving national security. * * *"

The third report- that Congress contracted for, by ECON, Inc., concluded that in-depth studies were needed because of the substantial financial risks that will be created for the taxpayers.

Now I agree with the Secretary that in the area of land remote-sensing a vigorous policy initiative is needed or the United States will lose its rapidly dwindling technological advantage in this field. As you and I have discussed informally, the French, the Japanese, and perhaps several other countries are hard at our heels and will pass us if we do not get cracking.

But I do not agree, nor do any of the experts who have looked at this problem, that we should sell a weather satellite system that is working well in order to cross-subsidize our land remote-sensing capability. There must be options for preserving our capabilities in land remote-sensing without selling weather satellites.

We hope we will have the chance to get your views on many of these matters.

Now I would like to yield to my colleague, Mr. Volkmer from Missouri, who is cochairing these hearings with us.

Mr. VOLKMER. I, too, wish to join the chairman of the full committee and the chairman of the other subcommittee, Mr. Scheuer, in welcoming Secretary Baldrige here today to open a series of hearings on proposed commercialization of land and weather satellites.

As has been noted, we have a continuing interest in this matter. Just 2 days ago this interest and our concern was reiterated when the committee adopted Mr. Bateman's amendment to title II of the 1984 NASA authorization bill, which asks the Secretary of Commerce to recommend to us the policies, procedures, conditions, and limitations to which any transfers should be subject.

I would encourage the Secretary to submit his recommendations to us relatively soon in order that we know exactly what the President decides and exactly what process is now underway.

I do not think it is an overstatement to say that the announcement on March 8 of a Presidential decision was greeted with a large amount of negativism. This was evidenced by the quick adoption of the Huddleston amendment to the jobs bill in the Senate. This amendment expressed a sense of the Congress that no effort shall be made to dismantle, transfer, release, or sell any portion of these systems without prior congressional approval. In debate supporting this amendment, the lack of congressional consultation was mentioned.

The point I want to make is that if we are to move ahead constructively and positively, there needs to be a new approach. Assertions that things will be different are not enough.

For example, it is my understanding that the reports mandated in title II of last year's NASA bill have not yet been delivered to all members of the committee, and there is perception among many people outside the Government that the decision to transfer the satellites has been made and is moving irresistibly to a preconceived conclusion.

What I want to say is that I hope today's hearing marks the start of a new approach and that it is in this spirit that I heartily welcome the Secretary.

Thank you, Mr. Chairman.

Mr. SCHEUER. Mr. Winn?

Mr. WINN. Thank you, Mr. Chairman.

I would ask unanimous consent that the opening statement by Mr. McGrath be included in the record at this time.

Mr. SCHEUER. Without objection, so ordered.

Mr. WINN. Thank you.

[The opening statement of Raymond J. McGrath follows:]

HONORABLE RAYMOND J. MCGRATH
HEARING ON COMMERCIALIZATION OF REMOTE SENSING SATELLITES
APRIL 14, 1983

MR. SECRETARY, I WANT TO JOIN MY COLLEAGUES IN WELCOMING YOU HERE THIS MORNING.

I AM VERY PLEASED THAT YOU SAW FIT TO COME UP HERE YOURSELF THIS MORNING TO EXPLAIN THE DECISION REGARDING THE TRANSFER OF THE SATELLITES.

AS YOU KNOW, MR. SECRETARY, I HAVE SOME VERY REAL CONCERNS OVER THE TRANSFER OF BOTH THE LAND AND WEATHER SATELLITES. IT SEEMS TO ME THAT THERE ARE JUST TOO MANY QUESTIONS IN THE AREAS OF NATIONAL SECURITY, OUR INTERNATIONAL OBLIGATIONS, AND THE PUBLIC HEALTH AND SAFETY TO PERMIT THE TRANSFER OF THE WEATHER SATELLITES.

AS FAR AS THE LAND REMOTE SENSING SATELLITES ARE CONCERNED, WE NEED TO BE VERY SURE THAT THERE IS A VIABLE MARKET WHICH CAN BE DEVELOPED SO THAT THE GOVERNMENT DOES NOT END UP TAKING BACK A FAILED VENTURE.

FINALLY, UNDER NO CIRCUMSTANCES, SHOULD THE SYSTEMS BE TRANSFERRED UNLESS IT IS A GOOD DEAL FOR THE AMERICAN TAXPAYERS.

I AM CONFIDENT THAT THE CONGRESS WILL HAVE CONSIDERABLE INPUT AS YOU EXPLORE THE POSSIBILITY OF IMPLEMENTING THE TRANSFER OF THESE SYSTEMS.

I THANK YOU FOR JOINING US THIS MORNING, AND LOOK FORWARD TO RECEIVING YOUR TESTIMONY.

Mr. SCHEUER. Mr. Lujan of New Mexico?

Mr. LUJAN. Thank you, Mr. Chairman.

Let me just welcome the Secretary this morning to our hearings and give a little unsolicited advice.

What I see developing from this hearing is that you have not made any engineering studies, all of those things, and that you have not asked or taken into consideration the advice of the various Government agencies.

It has been my experience that most of those Government agencies are going to tell you not to do anything about either Landsat or Metsat. It is difficult for them to let go of the apron strings. Therefore, I would caution you to be very careful about taking the advice of those who really are opposed to even looking at the problem.

Also, it seems to me that we are proceeding—or at least starting—into this hearing with a preconceived notion that a decision has been made to either sell one or the other or both of them. It is my understanding that no such decision has been made; that, as a matter of fact, the request for proposals—and I am sure you will address that in your testimony—are out there to see if it works, to see if we should proceed along those lines.

Therefore, Mr. Secretary, I look forward to listening to your testimony, so that we can clear up some of those misconceptions that the decision has been made to sell either or both.

Thank you, Mr. Chairman.

[The opening statement by Manuel Lujan follows:]

HONORABLE MANUEL LUJAN, JR.

HEARING ON COMMERCIALIZATION OF U.S. CIVIL REMOTE SENSING SATELLITE SYSTEMS

OPENING STATEMENT

APRIL 14, 1983

THANK YOU, MR. CHAIRMAN. I AM FAMILIAR WITH THE POTENTIAL COMMERCIAL VALUE OF THE LANDSAT SYSTEM SINCE THE TECHNICAL APPLICATIONS CENTER IN ALBUQUERQUE HAS BEEN WORKING WITH APPLICATIONS OF LANDSAT DATA. HOWEVER WE HAVE ALL BEEN FRUSTRATED WITH THE FACT THAT THERE IS NOT YET A BOOMING COMMERCIAL MARKET FOR LANDSAT DATA. I THINK THAT IS BECAUSE THE GOVERNMENT IS NOT ORIENTED TOWARDS MARKETING (NOR SHOULD IT BE). THE PRIVATE SECTOR CAN BEST DEVELOP THE COMMERCIAL POTENTIAL OF LANDSAT DATA. I AM AWARE THAT SOME FIRMS BELIEVE THAT REMOTE SENSING DATA CAN BE A COMMERCIAL SUCCESS NOW, ESPECIALLY IN THE INTERNATIONAL MARKET. THAT SOUNDS EXACTLY LIKE WHAT WE NEED.

I ENTHUSIASTICALLY ENDORSE THE IDEA OF TRANSFERRING THE REMOTE SENSING TECHNOLOGY TO THE PRIVATE SECTOR. I AM ALSO QUITE AWARE THAT THE TRANSFER OF A FEDERALLY DEVELOPED TECHNOLOGY TO THE PRIVATE SECTOR IS ALWAYS DIFFICULT. ALL TOO OFTEN THE FEDERAL AGENCY RESPONSIBLE DOES NOT WANT TO LET GO. PERHAPS THE BUREAUCRATS RESPONSIBLE FOR THE PARTICULAR PROGRAM ARE PROTECTING THEIR JOBS. PERHAPS IT IS LIKE DOTING PARENTS WHO DON'T WANT TO LET THEIR BABY GROW UP AND LEAVE HOME -- EVEN WHEN THE BABY IS 30 YEARS OLD. CERTAINLY COMMERCIALIZATION OF A TECHNOLOGY CAN BE DONE TOO SOON SO THE RESULT IS A FAILURE. ON THE OTHER HAND, WHEN COMMERCIALIZATION IS DELAYED TOO MUCH, THE GOVERNMENT PROGRAMS THEMSELVES PREVENT THE DEVELOPMENT OF A COMMERCIAL CAPABILITY. WHEN PRIVATE INDUSTRY CAN DO THE JOB, THE GOVERNMENT SHOULD NOT COMPETE.

AS YOU ARE AWARE, MR. CHAIRMAN, THE COMMERCIALIZATION OF REMOTE SENSING HAS BEEN STUDIED AND HAS BEEN THE SUBJECT OF HEARINGS FOR FIVE YEARS NOW. THE SPACE SCIENCE AND APPLICATIONS SUBCOMMITTEE HAS BEEN ON RECORD FOR SEVERAL YEARS AS SUPPORTING THE TRANSFER OF LANDSAT TO THE PRIVATE SECTOR. IN FACT I BELIEVE THAT A COUPLE OF YEARS AGO, EARLY IN THE LAST CONGRESS, MEMBERS OF THE COMMITTEE WERE BERATING THIS ADMINISTRATION FOR NOT MOVING FAST ENOUGH. NOW I UNDERSTAND SOME OF THOSE SAME MEMBERS ARE COMPLAINING THAT THE DECISION IS TOO HASTY.

IT IS CLEAR TO ME THAT THE ADMINISTRATION CANNOT NOR WILL NOT MOVE FORWARD ON THE TRANSFER WITHOUT LEGISLATION. THIS MEANS THE DEPARTMENT OF COMMERCE MUST PREPARE THE LEGISLATION TO BE SUBMITTED TO CONGRESS AND MUST BE PREPARED TO ANSWER THE QUESTIONS CONGRESS IS SURE TO ASK ABOUT THE PROPOSED LEGISLATION. AND THAT IS EXACTLY WHAT I UNDERSTAND IS HAPPENING NOW. THE DEPARTMENT OF COMMERCE IS NOW IN THE PROCESS OF COMPLETING THEIR ANALYSIS OF THE VARIOUS ASPECTS AND ISSUES INVOLVED IN TRANSFERRING REMOTE SENSING TO THE PRIVATE SECTOR. THIS IS WHAT THEY SHOULD BE DOING.

PART OF THIS PROCESS IS A PUBLIC DISCUSSION OF THE ISSUES AND CONCERNS -- NOT JUST A GENERALIZED "WHAT-IF" TYPE OF DISCUSSION, BUT A FOCUSED DISCUSSION SUCH THAT ANSWERS AND UNDERSTANDING ARE THE RESULTS. THIS DISCUSSION SHOULD INVOLVE THE PERTINENT GOVERNMENT AGENCIES, THE PORTION OF THE PRIVATE SECTOR THAT WILL BE INVOLVED, THE RESEARCH COMMUNITY, THOSE CONCERNED WITH THE INTERNATIONAL ASPECTS, AND OF COURSE OURSELVES, SINCE IT IS CONGRESS WHO WILL HAVE TO DEAL WITH THE LEGISLATION. I THINK THE PRESIDENT'S DECISION SERVED THE IMPORTANT PURPOSE OF INITIATING THIS DISCUSSION IN EARNEST. WITHOUT THAT CLEAR SIGNAL, THE ENDLESS STUDIES AND HEARINGS AND TALK WOULD CONTINUE WITHOUT RESOLUTION.

SOME PEOPLE SEEM TO BE INORDINATELY CONCERNED WITH THE PROCESS INVOLVED IN THE PRESIDENT'S DECISION, RATHER THAN FOCUSING ON WHAT THE DECISION WAS AND WHAT WE BELIEVE SHOULD BE THE PROCESS FOR IMPLEMENTING THE TRANSFER. IT IS OUR RESPONSIBILITY TO WORK WITH SECRETARY BALDRIGE TO ASSURE THAT THE COMMERCIALIZATION PROCESS MOVES AHEAD IN A TIMELY MANNER AND IN THE DIRECTION WE WANT TO GO. ALL OF US PROBABLY AGREE THAT THERE SHOULD BE A COMPETITIVE PROCESS AND THAT PROPOSALS SHOULD BE ABLE TO ADDRESS EITHER THE LANDSAT OR THE METSAT SYSTEM, OR BOTH. ALL OF US PROBABLY AGREE THAT ALL THE CONCERNS OF THE VARIOUS FEDERAL AGENCIES SHOULD BE TAKEN CARE OF. ALL OF US PROBABLY AGREE THAT THE LEGAL REQUIREMENTS SHOULD BE DEFINED BEFORE WE MOVE AHEAD WITH LEGISLATION. ALL OF US PROBABLY AGREE THAT DELAYS IN IMPLEMENTING THE TRANSFER WILL THREATEN THE COMPETITIVE NATURE BECAUSE SMALLER FIRMS CANNOT AFFORD TO BE PUT ON HOLD FOR A COUPLE OF YEARS. SO LET'S NOT WASTE OUR TIME AND THE PRIVATE SECTOR'S MONEY (AND MAYBE THE GOVERNMENT'S MONEY AS WELL!) WORRYING ABOUT THE PAST. LET'S START THINKING ABOUT THE FUTURE. THERE IS A SAYING THAT "THE FUTURE BELONGS TO THOSE WHO PLAN IT."

THANK YOU, MR. CHAIRMAN.

Mr. SCHEUER. Thank you, Mr. Lujan.

Congressman Mike Andrews of Texas?

Mr. ANDREWS. I do not have an opening statement.

Mr. SCHEUER. All right.

Congresswoman Claudine Schneider of Rhode Island?

Mrs. SCHNEIDER. Thank you, Mr. Chairman.

I welcome you, Mr. Baldrige. I am looking forward to your testimony, and I see by the people that you have accompanying you today, that you are planning on giving us all the answers that this insightful committee is looking for.

I think that most of our questions, as has already been indicated, will focus on both the short- and the long-term cost and benefits to the taxpayer, and we are looking forward, also, to comments on the international impact of commercialization.

We thank you for taking the time to come here today, and I will ask your pardon early on because I have two other hearings going on at this moment and a markup. Therefore, I will be ducking in and out, but please know that I am very interested in your presentation.

Thank you.

Thank you, Mr. Chairman.

Mr. SCHEUER. Congressman Bateman of Virginia?

Mr. BATEMAN. Thank you, Mr. Chairman.

I simply welcome the distinguished witness, Secretary Baldrige. I am ready and anxious to hear his testimony.

Mr. SCHEUER. Congressman Buddy MacKay?

Mr. MACKAY. Mr. Chairman, it is interesting to me that this committee is sponsoring today a workshop on National Science and Technology data policy. I briefly attended the opening part of that just a few minutes ago and heard an extensive discussion of the huge costs to our society because we do not have a national policy that permits the wide dissemination of the research data that is coming from federally funded research. Therefore, there are huge mistakes being made because one arm of Government—or one part of the private sector doing research funded by Government—is not aware of the findings of other arms of Government.

I note that one of the examples being used in that workshop is a statement by Dr. James V. Taranik, who is apparently involved in geology. The example he uses is the proposed transfer, the premature transfer, of the Landsat program into the private sector. He gives three detailed examples of how this is going to mess up—I am not a technician—how what one arm of Government has decided to do is going to mess up federally funded projects that are very significant, it appears to me, and these messups apparently are going to come about from a discontinuity in Landsat data, from a great increase in the cost for Landsat data, and probably from a discontinuity in further basic research in land remote-sensing.

I assume that Mr. Baldrige is able to tell us that this was all taken into account and that in this forum he is going to give answers to the problem which is being currently spelled out in the other forum now being sponsored by this committee.

Thank you, Mr. Chairman.

Mr. SCHEUER. Mr. Chandler of Washington?

Mr. CHANDLER. No comments, Mr. Chairman.

Mr. SCHEUER. Mr. Tom Harkin of Iowa?

Mr. HARKIN. I have no opening statement, Mr. Chairman.

Mr. SCHEUER. Mr. Bob Walker of Pennsylvania?

Mr. WALKER. Thank you, Mr. Chairman.

We have heard a great deal in our country in recent months and recent years about the failure of our smokestack industries, about the need to look toward the future and replace the jobs that are going to be lost in some of those traditional large employers that this country has come to depend upon.

There are two routes we can follow. One is the route that is often suggested around this body, that we ought to create a lot of make-work jobs in society to replace the jobs that are being lost in industry. However, there is another potential that is before us, too, and that is growth. That is to look toward the future, to look toward the new opportunities that are available to us in our economy and in our society.

One of those opportunities exists in outer space, but it will only exist if Government has the willingness to give up some of its own power and put into the hands of commercial entities that will expand the scope of the economy and, therefore, expand job opportunities.

Mr. Secretary, it seems to me you are coming to us today with some hopeful new plans out of Government, to begin that process of commercialization of outer space. I welcome you here, and I thank you for taking your time to be with this committee to give us a chance to look toward an exciting new horizon.

Thank you, Mr. Chairman.

Mr. SCHEUER. All right, Mr. Secretary, we all have our remarks off our chests and into the record. We would be happy to hear you.

Your prepared remarks will be printed in full in the record, and please feel free either to just chat with us, generally summarizing your remarks or, if you would prefer, since it is a comparatively brief statement you are more than free to read it if you wish. However you would like to proceed, the time is yours.

We are delighted to have you here.

STATEMENT OF HON. MALCOLM BALDRIGE, SECRETARY OF COMMERCE

Secretary BALDRIGE. Probably the best way to work with this committee is to just skip this prepared text here, because I think, if I may say so, that there are more preconceived ideas on the other side of this microphone than I am carrying on this side. [Laughter.]

I will do my best to lay them to rest. You all have the prepared text. You know what it says. Therefore, let me make a few impromptu remarks.

When we looked at Landsat and Metsat the first thing that I gave my own personal attention to and felt was most important is that this country develop those techniques. This country should keep ahead in that area. We are seeing competition spring up around the world. The French, Japanese, a European group, and the Canadians have all announced their intention to get into this business.

The ones furthest ahead are probably the Japanese and the French, and they are ahead of us—or will be ahead of us when they put up their satellites in the next few years, ahead of us in several respects.

They will be competing with the U.S. users in this area and looking for customers in this country. Therefore, I think we need to keep ahead in the technology. What is the best way to do that? To develop markets that, in turn, force new technology on the industry, develop jobs that way, and all of the other advantages that come from that.

The idea of transferring satellites—civil, remote-sensing satellites—from the Government to the private sector is not a new one. It has been around for over 5 years. It was part of the Presidential policy in the last administration. In 1978, President Carter signed a Presidential directive indicating that the Government should look into the transfer of these satellites to the private sector. The difference is that after 5 years of talking this is the first time that anything has been done about it.

We have been through survey after survey; we have gotten advice and put out requests for information to the private sector; we have addressed all kinds of issues in four different Cabinet meetings and a great many meetings of the working groups. I am personally convinced of this: There is no particular further cost-benefit analysis that could be made. There is no particular engineering study that could be made further that would give us clear and definitive answers. The only way to get an answer is to send out a request for proposals, as we are proposing to do, that list all of the security, the foreign policy, the National Weather Service, the financial points that have to be addressed, and the survey that I will believe—and the only one that I will believe—is when I see somebody sign their name to a proposal guaranteeing that they will address those in a way that we feel is proper and put a price tag on it so that we can look to see if it is the right way to go as far as the taxpayers of this country are concerned. That is the only kind of a survey that we could believe.

Now we could study this to death for another 5 years, if that ends up to be the case, and we will not be any further along than we are now. In the meantime, we are being driven, to some extent, by the fact that the competition is increasing in this area worldwide and, because of Government budget constraints in this or any other administration, you see natural tendencies to cut back on the financing for this particular area.

Therefore, Mr. Chairman, let me say that there are some misconceptions. The President's decision meant that we are going—because of the seriousness of this problem, because it is the only way I know how to settle it—to prepare a requests for proposals on as broad a basis as possible, to include all kinds of companies and favor none, so that you can bid on just Landsat, on just Metsat, or a combination of the two.

When we have prepared a request for proposals and before it is set in concrete, when we have the first broad outline ready, we will come to the Congress, to the appropriate committees, and discuss

them with you and consult with you on what changes or ideas you may have to improve them.

When we send out the request for proposals and the answers come back, we will again consult with and give our recommendation to Congress, and in that case the ball will be in your lap. This will not be done—as a matter of fact, I do not think it can be done—by Executive order. It will be a matter of legislation required by the U.S. Congress.

Therefore, you will be fully informed and consulted all the way in this process.

It is possible that we will get no bids back that we can agree will advance all of the interests of the United States that I have outlined. It is possible that we will get some back that will. We just do not know yet, but there is only one way to find out, and that is to go to the market and ask.

I will be glad to take any questions that you have, Mr. Chairman.

[The prepared statement, plus responses to additional questions of Secretary Baldrige follows:]

UNITED STATES DEPARTMENT OF
COMMERCE
NEWS
WASHINGTON, D.C. 20230

OFFICE
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SECRETARY

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FOR RELEASE: 9:30 a.m.,
April 14, 1983

BALDRIGE SAYS U.S. MUST ACT NOW
TO PRE-EMPT FOREIGN COMPETITION
IN LAND AND WEATHER SATELLITE MARKETS

Commerce Secretary Malcolm Baldrige today said it is important that the administration act now to find out if a transfer of government land and weather satellites to the private sector is possible because other nations soon will be competing for the same satellite markets.

Testifying before the House Committee on Science and Technology, Baldrige said there is a pressing need to develop a strong commercial market for Landsat data. The market will not grow as rapidly as it should while Landsat is being operated by Commerce's National Oceanic and Atmospheric Administration (NOAA), he said.

He said France, Japan, Canada, Germany and the European Space Agency are developing satellite remote sensing programs and postponing a decision will give them a head start that will be hard to overcome later.

"Much of the technology on which these programs depend was developed here," Baldrige said. "It would be ironic if these countries, building on skills developed in the United States, established the kind of market that NOAA can't and turned us into a net importer of satellite data products and services."

Baldrige said the nation's best defense against impending competition is to get the land and weather satellites into the hands of firms that can build on the technology and know how to provide what customers need.

"If other countries are successful in their efforts to develop and fly better satellites and meet user needs, potential customers will turn to them," he said.

Baldrige said President Reagan has laid down clear ground rules for deciding whether a transfer would be consistent with the national interest.

"No transfer can take place unless the country's defense and foreign policy interests are protected," Baldrige said, adding that he is confident these aspects of a transfer can be resolved.

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STATEMENT OF

SECRETARY OF COMMERCE MALCOLM BALDRIGE

BEFORE THE

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE

RESEARCH AND ENVIRONMENT

AND THE

SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS

OF THE

COMMITTEE ON SCIENCE AND TECHNOLOGY

UNITED STATES HOUSE OF REPRESENTATIVES

APRIL 14, 1983

CHAIRMAN SCHEUER, CHAIRMAN VOLKMER, MEMBERS OF THE SUBCOMMITTEES, I AM PLEASED TO BE HERE TO DISCUSS THE ADMINISTRATION'S PROPOSAL FOR TRANSFERRING NOAA'S LAND AND WEATHER SATELLITES TO THE PRIVATE SECTOR. I APPRECIATE THE OPPORTUNITY THIS HEARING GIVES US TO SET OUT FOR PUBLIC REVIEW THE ADMINISTRATION PROPOSAL AND THE ARGUMENTS FOR THE PROPOSAL.

THE BEST WAY TO BEGIN IS TO EXPLAIN WHAT THE PRESIDENT DECIDED, AND THEN DISCUSS WHY.

FIRST, THE PRESIDENT RECOGNIZED THAT THERE WOULD BE GREAT BENEFITS TO THE COUNTRY IF THE PRIVATE SECTOR WERE ABLE TO OPERATE LANDSAT AND MARKET THE DATA IT GENERATES BY THE SYSTEM. THIS IDEA IS NOT NEW. THE PREVIOUS ADMINISTRATION RECOGNIZED THE BENEFITS OF PRIVATE OPERATION OF LANDSAT.

SECOND, THE PRESIDENT DECIDED THAT WE SHOULD BEGIN THE WORK NECESSARY TO FIND OUT WHETHER THE PRIVATE SECTOR IS WILLING AND ABLE TO OPERATE EITHER LANDSAT ALONE - OR LANDSAT AND THE WEATHER SATELLITES TOGETHER - OR THE WEATHER SATELLITES ALONE.

FINALLY, THE PRESIDENT LAID DOWN SOME CLEAR GROUND RULES FOR DECIDING WHETHER IT IS CONSISTENT WITH THE NATIONAL INTEREST TO TRANSFER LANDSAT ALONE OR LANDSAT AND THE WEATHER SATELLITES TO A PRIVATE OPERATOR:

- NO TRANSFER CAN TAKE PLACE UNLESS OUR DEFENSE AND FOREIGN POLICY INTERESTS ARE PROTECTED.

- NO TRANSFER CAN TAKE PLACE UNLESS THE DATA THAT THE WEATHER SERVICE NEEDS TO OFFER THE PUBLIC THE SERVICES IT NOW PROVIDES IS GUARANTEED.

- ALSO, IT HAS TO BE A GOOD DEAL FOR THE TAXPAYERS.

THERE IS A PRESSING NEED TO DEVELOP A STRONG COMMERCIAL MARKET FOR LANDSAT DATA. THE MARKET WILL NOT GROW AS RAPIDLY AS IT SHOULD WHILE LANDSAT IS BEING OPERATED BY A GOVERNMENT AGENCY. GOVERNMENT AGENCIES SIMPLY LACK THE INCENTIVE AND ABILITY TO DEVELOP DOMESTIC AND INTERNATIONAL COMMERCIAL MARKETS. THE PRIVATE SECTOR HAS A PROFIT INCENTIVE AND EXPERIENCE IN MARKETING NEW PRODUCTS. FOR THESE REASONS, THE PRIVATE SECTOR IS FAR MORE ABLE THAN GOVERNMENT TO PERFORM THE CHALLENGING JOB OF EXPANDING THE MARKET BASE FOR LANDSAT DATA.

THE POTENTIAL FOR COMMERCIAL MARKET DEVELOPMENT IS THERE. OVER THE YEARS, MINERAL AND ENERGY COMPANIES, FIBER AND FOOD CROP INTERESTS, TIMBER PRODUCERS, LAND USE PLANNERS AND HYDROLOGY CONSULTANTS ALL DISCOVERED THERE WAS VALUE IN LANDSAT DATA.

BUT NOAA ISN'T A MARKETING AGENCY. THE TAXPAYERS DON'T EXPECT IT TO TAKE ON COMMERCIAL RISKS NECESSARY FOR DEVELOPING MARKETS FOR GOODS AND SERVICES. THESE ARE TASKS THAT ONLY PRIVATE FIRMS HANDLE WELL. IF THE GOVERNMENT CONTINUES IN CHARGE OF LANDSAT, POTENTIAL ECONOMIC BENEFITS WILL SLIP AWAY FROM US.

AT THE SAME TIME, WE RECOGNIZE THAT OPERATING LANDSAT IN A WAY THAT SATISFIES THE GOVERNMENT'S NEEDS FOR DATA NOW GENERATED BY THE SYSTEM POSES GREAT FINANCIAL RISKS TO A PRIVATE OPERATOR. FOR NATIONAL SECURITY AND FOREIGN POLICY REASONS, THE GOVERNMENT MUST IMPOSE CERTAIN RESTRICTIONS ON ANY PRIVATE OPERATOR. IT IS POSSIBLE THAT NO FIRM WOULD BE WILLING TO TAKE ON OPERATING LANDSAT WITH THESE RESTRICTIONS AND THE NEED TO SPEND THE MONEY NECESSARY TO DEVELOP MARKETS.

ANY PRIVATE FIRM THAT UNDERTAKES TO ACQUIRE THE LANDSAT SYSTEM, BUY FOLLOW-ON SATELLITES AND ESTABLISH A PRIVATE MARKET FACES A VERY REAL RISK. THAT'S THE MAIN REASON FOR ALLOWING THE PRIVATE SECTOR TO BID ON THE WEATHER SATELLITES.

THEY CAN PROVIDE THE REVENUE BASE A PRIVATE OPERATOR NEEDS TO TAKE ON THE COST OF DEVELOPING PRIVATE COMMERCIAL MARKETS FOR DATA GENERATED BY THE SYSTEMS. DOING THIS EXPANDS THE RANGE OF OPTIONS OPEN TO US IN GOVERNMENT. ONCE BIDS ARE IN, WE MAY FIND THAT THE COMBINATION OF REVENUES FROM WEATHER OPERATIONS AND ECONOMIES MADE POSSIBLE BY INTEGRATING THE SYSTEMS CAN LEAD TO BETTER LAND AND WEATHER DATA FOR EVERYBODY AT LESS COST.

THE WEATHER SERVICE WILL NOT SUFFER. THE DATA IT NEEDS WILL BE AVAILABLE.

I WANT TO MAKE THIS ABSOLUTELY CLEAR: WE ARE NOT DISMANTLING, DISBANDING, SELLING OR IN ANY WAY HARMING THE NATIONAL WEATHER SERVICE. THERE'S BEEN MORE CONFUSION ON THIS ISSUE THAN ON ANY OTHER PART OF OUR PROPOSAL.

THE WEATHER SERVICE WILL BE AROUND FOR A LONG, LONG TIME. THE ONLY DIFFERENCE WE MAY SEE IS THAT THE SATELLITE DATA IT USES WILL COME FROM A PRIVATE OPERATOR INSTEAD OF THE GOVERNMENT'S ENVIRONMENTAL SATELLITE, DATA AND INFORMATION SERVICE, WHERE THE WEATHER SERVICE NOW GETS THE DATA.

I'M JUST AS CONFIDENT THAT WE CAN IDENTIFY AND RESOLVE THE NATIONAL SECURITY AND FOREIGN POLICY ASPECTS OF A TRANSFER.

WE WILL BE CERTAIN THAT AN OPERATOR PROVIDES PRIORITY SERVICE TO THE DEFENSE DEPARTMENT; THAT THERE WILL BE ADEQUATE

CONTROLS FOR DENYING SATELLITE USE TO HOSTILE FORCES; AND THAT COMMAND AND CONTROL CAN BE TRANSFERRED TO DOD IN EMERGENCIES.

IN ADDITION, WE HAVE NO INTENTION OF CHANGING OUR POLICY OF PARTICIPATING IN THE FREE, INTERNATIONAL EXCHANGE OF WEATHER DATA. WE FULLY UNDERSTAND THAT NO COUNTRY'S FORECASTING SERVICE CAN OPERATE ONLY WITH DATA TAKEN WITHIN IT'S OWN NATIONAL BOUNDARIES.

ANOTHER MAJOR ISSUE THAT WE WILL LOOK AT IS THE EXTENT TO WHICH A PRIVATE OPERATOR CAN CONTROL THE SATELLITE DATA. WE'LL WANT TO GIVE HIM AS MUCH FREEDOM AS WE CAN BUT WE WILL HAVE TO CONSIDER THIS ISSUE FROM AT LEAST TWO STANDPOINTS.

FIRST, WE WILL MAKE SURE THAT INTERNATIONAL ACCEPTANCE OF THE "OPEN SKIES POLICY" IS NOT JEOPARDIZED - THAT IS, OUR FREEDOM TO COLLECT SATELLITE DATA OVER OTHER NATIONS FOR PEACEFUL PURPOSES. TO ENSURE ITS ACCEPTANCE, WE HAVE FOLLOWED A PRACTICE OF SHARING THE BENEFITS OF CIVIL REMOTE SENSING TECHNOLOGY ON A NONDISCRIMINATORY BASIS. THESE POLICIES AND PRACTICES HAVE SERVED US WELL. STRIKING THE PROPER BALANCE BETWEEN THEM AND AN OPERATOR'S NEEDS WILL BE A TOP PRIORITY.

SECOND, WE WILL BE ALERT TO THE POSSIBILITY THAT LANDSAT DATA MAY HAVE IMPORTANT MILITARY VALUE. THIS CAN BE PARTICULARLY

IMPORTANT AS SATELLITE TECHNOLOGY ADVANCES AND VALUE-ADDED SERVICES BECOME MORE SOPHISTICATED. IT CAN BE ESPECIALLY IMPORTANT IF OUR EFFORTS ARE SO SUCCESSFUL THAT OTHER PRIVATE FIRMS ENTER THE FIELD. WE'LL BE WORKING VERY CLOSELY WITH DOD ON THIS.

IN SHORT, THE TRANSFER WE PROPOSE IS NO EASY THING AND NO SURE THING. BUT NONE OF THE PROBLEMS INVOLVED ARE BEYOND HUMAN EFFORT AND INGENUITY. THEY CAN BE HANDLED BY LEGISLATION, CONTRACTS, REGULATION TO THE EXTENT NEEDED, AND GOOD WORKING RELATIONSHIPS BETWEEN AGENCIES AND THE PRIVATE OPERATOR. IT'S IMPORTANT THAT WE TRY. AND THAT BRINGS ME TO THE LAST PART OF THE ADMINISTRATION'S DECISION: WHY IS IT SO IMPORTANT THAT WE ACT NOW TO FIND OUT IF A TRANSFER IS POSSIBLE?

IF WE CONTINUE WITH GOVERNMENT OPERATION OF THE LAND AND WEATHER SATELLITES AND OTHER COUNTRIES ARE SUCCESSFUL IN THEIR EFFORTS TO DEVELOP AND FLY BETTER SATELLITES AND MEET USER NEEDS, POTENTIAL CUSTOMERS WILL TURN TO THEM. OUR BEST DEFENSE AGAINST IMPENDING COMPETITION IS TO GET THESE SATELLITES INTO THE HANDS OF A COMPETENT FIRM THAT CAN BUILD ON THE TECHNOLOGY AND KNOWS HOW TO PROVIDE WHAT CUSTOMERS NEED.

FRANCE INTENDS TO LAUNCH THE FIRST OF A SERIES OF FOUR LAND-

OBSERVING SATELLITES IN 1984. JAPAN, CANADA, GERMANY, THE EUROPEAN SPACE AGENCY, INDIA AND THE SOVIET UNION ARE ALL ACTIVELY DEVELOPING SATELLITE REMOTE SENSING PROGRAMS.

MUCH OF THE TECHNOLOGY ON WHICH THESE PROGRAMS DEPEND WAS DEVELOPED HERE. IT WOULD BE IRONIC IF THESE COUNTRIES, BUILDING ON SKILLS DEVELOPED IN THE UNITED STATES, ESTABLISHED THE KIND OF MARKET THAT NOAA CAN'T AND TURNED US INTO A NET IMPORTER OF SATELLITE DATA PRODUCTS AND SERVICES.

POSTPONING A DECISION WILL ONLY GIVE THESE COUNTRIES A HEAD START THAT WILL BE HARD TO OVERCOME LATER. THE LONGER WE WAIT, THE MORE LIKELY THIS BECOMES.

OUR PLAN WILL LET US FIND OUT ONCE AND FOR ALL IF LANDSAT HAS SUBSTANTIAL ECONOMIC VALUE AND WHETHER A TRANSFER TO THE PRIVATE SECTOR UNDER THE CONDITIONS IMPOSED BY THE PRESIDENT IS POSSIBLE.

WE HAVE A LOT TO DO. WE HAVE TO DEVELOP THE GROUND RULES UNDER WHICH COMPETITIVE BIDDING CAN TAKE PLACE. WE HAVE TO DESIGN A REQUEST FOR PROPOSALS AND A PROCEDURE FOR EVALUATING THE PROPOSAL SUBMITTED. WE HAVE TO ESTABLISH AN INTER-AGENCY COORDINATING BODY TO MAKE SURE ALL PROPER FEDERAL INTERESTS ARE TAKEN CARE OF. IF WE FIND THAT A TRANSFER IS FEASIBLE, WE WILL HAVE TO DEVELOP AND SUBMIT TO THE CONGRESS THE LEGISLATIVE AUTHORIZATION NECESSARY TO ACHIEVE A TRANSFER. BUT WE WILL NOT WAIT UNTIL WE PROPOSE LEGISLATIVE AUTHORIZATION FOR A TRANSFER TO CONSULT WITH THE APPROPRIATE CONGRESSIONAL COMMITTEES. WE INTEND TO INVOLVE THESE COMMITTEES IN EVERY SIGNIFICANT STEP WE TAKE. IN FACT, WHAT I HAVE IN MIND IS MORE THAN "CONSULTING." WE'LL BE ACTIVELY SEEKING CONGRESS' ADVICE AND GUIDANCE AS WE GO ALONG. WE'RE PRETTY SURE CONGRESS WON'T BE TOO SHY ABOUT PROVIDING IT.

THANK YOU.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Washington, D.C. 20230

THE ADMINISTRATOR

SEP 9 1983

Honorable Harold L. Volkmer
Chairman, Subcommittee on Space
Science and Applications
Committee on Science and Technology
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

Secretary Baldrige has asked that I convey on his behalf our responses to the additional questions concerning the transfer of our land and weather satellites which you submitted following the Secretary's testimony on April 14, 1983.

We have delayed our response until we established a position on international distribution of weather satellite data. As I have indicated in response to your second question, we believe that weather satellite data should continue to be made available to the international community under the same terms and conditions that prevail today. Briefings have been scheduled with your staff on pertinent Landsat and Metsat commercialization issues. Please advise us if there is any additional information that you require.

Sincerely,

for John V. Byrne

Enclosures

Answers to Additional Questions from Congressman Volkmer on Civil Space Remote Sensing

1. There seems to be something of a paradox in the approach being taken: On the one hand the statement is made that no final decision has been made, and that an RFP will be issued to see if the transfer will work. The premise is that only when industry responds by preparing a solid business proposal can we be sure that the information we get is realistic.

On the other hand we are asking industry to spend substantial funds in preparing a proposal as if a final decision to commercialize had been made.

Even if the Executive Branch has made a decision, the Congress has not, and the Congress has expressed more than a little concern over this proposal.

(a) Is this fair to Industry?

(b) Can you seriously expect totally realistic, unhedged industry responses to an RFP whose terms can be only tentative?

(c) Does this situation perhaps argue for a phased approach wherein you would first submit for Congressional approval relatively simple recommendations on policy, procedures, conditions and limitations regarding the transfer?

Please comment on these questions.

(a) It is as long as industry understands the situation. I believe that they do.

(b) The proposals by industry may contain hedges. The number and nature of the conditions set in the proposals will give us a good idea of the value of the civil space remote sensing system to industry.

(c) Industry does want to know what Congress thinks on this issue. When the RFP is available, I expect that Congress will make its views known.

2. Presently foreign ground stations receive data directly from our weather satellites, at no extra cost to us or to them. How would this international transfer of data be handled if the satellites are commercialized?

My position and the position of the Interagency Board on Civil Operational Earth-Observing Satellite System (IB-COESS) is that weather satellite data would continue to be provided to the

international community under the same terms and conditions that prevail today. A complete description of our thoughts on this is contained in a draft section of the RFP entitled "Foreign Policy and International Requirements." This material has been provided to your staff.

3. According to letters attached to the Peck-Charles reports the Department of Justice does not believe that remote sensing from space is a natural monopoly. Yet transferring to one entity both weather and land satellites and giving that entity a guaranteed, multiyear data-purchase contract would establish a monopoly de facto. Please comment on this.

(a) Is the Department of Justice wrong?

(b) How do you plan to deal with this question?

(c) If only one company submits a realistic proposal will you have achieved the competitive process the President's decision is said to call for?

(a) No, but there can be a difference between Federal policy for an emerging business and policy for an established business.

(b) When we have specific proposals, we will work with Justice and Congress to find the approach that makes the most sense. I do not think that speculation on this issue is profitable at a theoretical level.

(c) The process will be competitive. If the result meets our selection criteria, one proposer could be quite acceptable.

4. Now that you have had more time to plan your activities concerning this issue--

(a) Exactly how do you plan to proceed? What are your milestones, major steps, etc.?

(b) Exactly how do you plan to consult formally with the Congress?

(c) Do you see any value in having the Congress formally on record concerning this issue at some point before a final decision as you go through the process?

(d) Specifically, if the Congress were to come up with an institutional alternative for commmercialization, i.e., a method different from the way your RFP would indicate, how would we get that into the process? For example, the Congress might favor phased commercialization beginning with value-added activities.

(a) I have enclosed a working draft of our plan. It will change as we receive comments and learn more about what we are doing. The SEB Chairman would like to receive comments from your staff on this plan.

(b) As you can see from the plan we have in mind a series of Congressional briefings on plans between June 15 and July 15, on the draft RFP in the Fall, on the general form and content of the responses to the RFP (if we can mutually find a way to do this that does not violate the SEB procedures) in late April of 1984 and discussions on legislation in the spring of 1984. In addition, of course, we are available for hearings and we are open to additional briefings as you request them.

(c) As I said in response to an earlier question, Congress will be able to comment on the RFP when it is available and I believe that this would be valuable.

(d) Reserving my opinion on your example, I believe that a statement of Congressional position would be useful

5. In your testimony you said that the decision "not to fund LANDSAT... was a budget decision, and it was the Administration's position. The Administration had already taken that position." Now you are moving toward requesting proposals for, among other things, private operation of LANDSAT. This seems to imply either that you have reversed your intention to end LANDSAT funding or that your request for proposals regarding LANDSAT is not firm. Or perhaps the only proposals that will be considered for LANDSAT are ones involving no Federal funding? Please comment.

The administration decision not to fund Landsat in the Federal budget reflected the decision not to extend operation of the land remote sensing satellite program as a Government program. It is this Administration's position that if a Landsat-like system is to become operational, it will do so because a private market is capable of supporting its cost. Because that market is not yet in existence, a private operator may require some support in the short term, such as by means of government purchases of data under a negotiated agreement, in order to permit that private operator to build the market through which the system can become self-sustaining.

6. The President's Private Sector Survey on Cost Control, Task Force Report on the Department of Commerce (April 15, 1983) addresses the remote sensing commercialization question. Beginning on page 120, they discuss an interesting alternative for "commercializing" the LANDSAT Data Services.

(a) Would you please comment on that report?

(b) What response have you made to the recommendations therein?
(c) Will your RFP allow for this alternative?

(a) We have received a preliminary copy of the Task Force Report. As I stated in my testimony on April 14, there have been a number of reports from a number of experts. The problem facing the Executive Branch and the Congress jointly is to distill all of this advice, to combine it with the proposals when they come in, and to arrive at a final solution which is the best in the long run for the United States. The Task Force report will be one valuable input in that process.

(b) At this point the report has not yet been officially released. Hence no response has been requested or given.

(c) I believe that an innovative offeror could construct a proposal incorporating the essential features of the Task Force recommendation.

Mr. SCHEUER. Mr. Secretary, you deserve the Congressional Medal of Honor for the most succinct, thoughtful, fine opening statement I have heard in a long time here from a Cabinet Secretary.

Secretary BALDRIGE. Thank you, sir.

Mr. SCHEUER. Ordinarily, they read and tend to be somewhat soporific, but that was a very fine summary of your position.

Secretary BALDRIGE. Does that mean I can leave now, Mr. Scheuer? [Laughter.]

Mr. SCHEUER. It may be the only nice thing I have to say this morning, so I want it to be on the record. [Laughter.]

The distinguished chairman of the Science and Technology Committee, Don Fuqua of Florida?

Mr. FUQUA. Mr. Chairman, I just have one or two questions to amplify or perhaps clarify points that are not clear.

It is my understanding in what you are saying, Mr. Secretary, that no final decision has been made on the methodology, the time, or the procedure of a transfer to anybody at this time? This is only exploratory?

Secretary BALDRIGE. Yes. It has to be until we work out the proper RFP. As I said, we will consult with you on that process. When the RFP is sent out and bids come back in, then we have to make the decision, and Congress certainly will be involved in that as the final arbiter.

Mr. FUQUA. And we will have access to the financial information, and so forth, as it relates to the cost to the Government?

Secretary BALDRIGE. Oh, the whole thing, absolutely. This is a terribly complex problem. You are balancing here national security interests that have to be addressed, National Weather Service interests, and we are trying to see if, in fact, a new industry can be created in this country to provide jobs, to provide technological leadership, because there will be a market for it, and at the same time assess whatever costs there are for whatever period of time to the U.S. Government. That will be a very complicated decision.

Mr. FUQUA. If I understand you correctly, before an RFP is submitted on the street, you will come back to the appropriate committees of the Congress to review what the RFP might contain?

Secretary BALDRIGE. Yes, sir, and get any ideas you have, any thoughts you might have on it. Absolutely.

Mr. FUQUA. Thank you very much, Mr. Chairman.

Thank you, Mr. Secretary.

Mr. SCHEUER. Congressman Larry Winn, the ranking minority member of the full committee?

Mr. WINN. Thank you, Mr. Chairman.

I just have a couple of short questions of the Secretary.

Mr. Secretary, is there any possibility that it would not be in the best interest of NOAA to support the decision for transfer?

Secretary BALDRIGE. You have touched on a bureaucratic fundamental, I guess. I would not say that about my own organization, but let me observe that human nature in general resists change. If you have anything to do with getting your salary from the particular part of the Department, whether it be industrial, governmental, or military, where change is proposed, you are going to find some people who are just dead against it.

Mr. WINN. I think that is very true. Some of the rumors that we have heard—that the subcommittees have heard—are that possibly some of the long-term employees have, let's say, been less than enthusiastic about a transfer.

You touched on this briefly, but I wonder if you could embellish this a little bit or enlarge it: What steps have you taken to insure that the private sector would have input in your evaluation of the feasibility of the transfer? You talked about sending out questionnaires.

Secretary BALDRIGE. When we asked the Halbouty Commission to research this for us and give us their ideas, we also sent out a request for information. We got 14 answers from various respondents that were interested in finally bidding, if this would come about, or just gave their thoughts in general.

We heard from these 14 companies. They were all the way from short letters to very lengthy documents. We did, in effect, poll the private sector on this as part of the process.

Mr. WINN. Are you still doing anything along that line? Are you still asking for industry input, private sector input?

Secretary BALDRIGE. We did ask for this as effectively as we could.

Mr. WINN. The Federal Register?

Secretary BALDRIGE. It was in the Commerce Business Daily. We put the request in there so that it would get disseminated as best it could.

Now we still have Dr. Halbouty working with us. We are thinking about retaining some other scientists to help spread the word, also.

Essentially, the only way we will know who is really interested is to put out a request for proposals where they have to go through the estimating, and so forth, and that is going to cost them some money. Therefore, a company would have to be serious to do that. It could not be just dashing off something on a postcard.

Mr. WINN. I think part of the confusion over your proposal stems from the fact that at the same time that you made public the decision to proceed with the commercialization you also made reference to two other sets of studies going on at NOAA. Could you de-

scribe these studies and their potential impact on the operations of the Weather Service?

Secretary BALDRIGE. I am not sure which two studies you mean.

Mr. WINN. One is related to OMB Circular No. A-76, "Policies for Acquiring Commercial or Industrial Products." That is one of them.

Secretary BALDRIGE. Yes. The A-76 study was a governmentwide study, where every department was asked to look at the services they were giving the public and to investigate whether any of them could be done better by the private sector. That was a governmentwide initiative.

The other one was special to NOAA in that we were making a study to see which of the services NOAA was providing was so specialized——

Mr. WINN. That would be the Booz-Allen-Hamilton study; is that right?

Secretary BALDRIGE. Yes, the Weather Service was the Booz-Allen study, but we have other studies going on besides that.

We were making a study to see which of those areas where we were giving service was so specialized and benefited such a few, such a small group of users, that perhaps they should be transferred to the private sector.

Those studies are fully independent of this proposed transfer. They really had nothing to do with each other.

Mr. WINN. I see.

Secretary BALDRIGE. However, I think you are right, Congressman, that they did get mixed up in some people's minds because the publicity came out at the same time.

Mr. WINN. Yes. I think because of the timing it did.

This is my final question, Mr. Chairman.

In the last full paragraph on page 3 of your statement, which we received last night, you seem to be saying that the main reason for allowing bids on the Government's weather satellites is to offer a steady source of revenue to potential bidders for the Landsat system. Your statement seems to imply, and I may be misinterpreting it, that the administration is linking transfer of the weather satellites to the transfer of the Landsat system and that no bidder will get one without the other. What would happen if the Government received a bid on the weather satellites alone? Would this bid be considered on its own or is there linkage?

Secretary BALDRIGE. Absolutely. That is the wrong interpretation, Congressman.

Did you say that was on page 3?

Mr. WINN. The last full paragraph on page 3 of your statement.

Secretary BALDRIGE. Possibly it is unclear, but I do not believe it lends itself to that interpretation. In any event, that is not the correct interpretation.

We would entertain and solicit bids for both individual bids on Landsat, individual bids on Metsat, or combination bids on both.

Mr. WINN. A company could bid on both or one or the other?

Secretary BALDRIGE. Or do it all four ways.

Mr. WINN. I think there has been some misinformation put out on that, too.

Thank you, Mr. Secretary.

Thank you, Mr. Chairman.

Secretary BALDRIGE. We did that to open the range of bidding so that as many companies as possible that had any interest would look at it.

Mr. SCHEUER. We are now going to proceed under the 10-minute rule.

I want to thank the chairman of the full committee, Mr. Fuqua, and Mr. Winn, the ranking minority member, for having yielded to me and Mr. Volkmer the unused balance of their 10 minutes. Mr. Volkmer and I will share that.

Secretary BALDRIGE. I am not sure I would thank them, though, Mr. Chairman.

Mr. SCHEUER. Mr. Secretary, as I mentioned in my brief opening remarks, I have a sense of disquietude about the process by which the April 1982 decision of the Cabinet Council got reversed by the end of the year. I am curious as to how that happened, since there were no meetings of the Cabinet Council in the interim and since, apparently, all of the good advice that you had at that time from the Department of Defense and from NASA—incidentally, did NASA and the Department of Defense have any self-interest, any ego interest, in the advice that they gave you? Could that have been tainted by any self-interest?

We have heard the implication that NOAA's recommendations were somehow or other tainted. How about NASA and the DOD?

Secretary BALDRIGE. I do not view any of those as being tainted, including NOAA. We are talking about asking for records on our whole system. I am not competent to judge the background on DOD's position.

Mr. SCHEUER. All right. Let's proceed to think about the process by which that April 1982 decision was reversed.

Can you tell us, for starters, of the decisions made by the Council on April 20, 1982?

Secretary BALDRIGE. May I begin on the first meeting? We had four Cabinet Council meetings. I will be very brief on this.

We had an interagency working group at work on this which included all the appropriate agencies. They had worked for some months. We had our first Cabinet Council meeting in December 1981. The chief conclusion that I drew from that meeting was that we had not done enough work. Therefore, we went back and asked the working groups for more information, more detailed information, to cover more points.

They reported back on March 17. That was the second Cabinet Council meeting on this subject. We reviewed the options developed by the working groups on the feasibility and likely consequences of transfer of Landsat and Metsat to the private sector.

At that time I—and I should not use the word "I" there but "we," but I certainly felt this strongly in particular—we felt that we did not have the national security aspects addressed enough at that time.

At the second Cabinet Council meeting——

Mr. SCHEUER. Now wait a minute. At that Cabinet Council meeting——

Secretary BALDRIGE. Yes, the second one.

Mr. SCHEUER. The second one, what was the recommendation that they made on Metsat, on the weather satellites?

Secretary BALDRIGE. We postponed action on the options, Mr. Chairman, because we did not feel that the security aspects had been addressed enough and given enough importance.

Whatever your notes tell you, I will guarantee you that is what happened there. I did not feel—and most of the members there did not feel—that we had given enough attention to the importance of the complicated national security issue, so we postponed action after that second Cabinet Council meeting for 30 days while we completed a review of the national security aspects of transferring the weather satellites. There was no action taken there.

At that point I did not—I would say we as a group had not felt that we had had enough attention paid to the security aspects. We asked the security people involved to take another 30 days and go into this in more depth, as much depth as they wanted, before we would make our final decision on the weather satellite.

They came back at the third Cabinet meeting on April 20. They gave us a full briefing on the classified aspects that were under national security, on the classified aspects of the operation of the weather satellites. At that time the feeling had almost reversed on security. At first I had the feeling that the Council had not paid enough attention to security. At the April meeting I felt, because we emphasized this so much and had this complete study, that the security problems looked almost insurmountable.

After that meeting, and this now gets to the direct point of your question——

Mr. SCHEUER. At that meeting what was the advice that the Cabinet Council gave you at the end of the April 20 meeting?

Secretary BALDRIGE. We had two or three different decisions, but one was, and the most important one was, that the weather satellites should not be transferred at that time.

Mr. SCHEUER. They said the weather satellites——

Secretary BALDRIGE. Should not be transferred, having said before that they should.

Mr. SCHEUER. Right.

On review, they now feel that they should not?

Secretary BALDRIGE. That they should not.

Mr. SCHEUER. As of April 20 of last year?

Secretary BALDRIGE. That is correct at that time, because of the national security aspects. That was the reason, the national security.

Because DOD, the Director of Central Intelligence, and the other people on this working group had given us a long list of national security problems that had to be addressed, after that meeting I felt that the private sector should have a chance to see if they could address those security problems. If the problems DOD had with security and that the Director of Central Intelligence had with security—if they would list those and if, in fact, in any transfer the private sector could address those security issues, then perhaps DOD and the Director of Central Intelligence could go along. That was the next step we took.

Comsat was the furthest along in this area and had studied it the most. I thought the only way to solve this problem and put it to

bed was to actually get our security people—I do not mean in the Commerce Department but the Government security people, the DCI and the DOD people—together with the Comsat people and have them explain their security problems and say, "Are there ways that the private sector can take care of these problems?" That is what happened.

When we had the fourth meeting, the final meeting, we made the recommendation to the President unanimously, including the security people present, because they were assured that that time that in our request for proposals their national security concerns would be addressed specifically and that when the RFP's came back that they would be on the interagency group reviewing this for the Government and could see whether, in fact, their security problems had been addressed. That was the reason for going first one way and then the other.

This whole process took four meetings. Frankly, Mr. Chairman, I am glad it did because it was too complicated to get done in one meeting. I have changed my own mind personally on this two or three times in the process.

Mr. SCHEUER. I will certainly admit it is an extraordinarily complicated matter, and I have had a lot more than four meetings and I am sure I do not understand all the ramifications of this matter, either.

All right. In effect, what the Cabinet Council said was: "We do not think it should be transferred, but we think an RFP makes sense, and let's put the security and other issues—let's embody them in the RFP and see what the private sector has to say about these matters"?

Secretary BALDRIGE. Mr. Chairman, if I can be very succinct, in four meetings—the first one we said: "We don't know enough." In the second one we said: "We should transfer both entities, but we had better check into the security." In the third one we said: "The security problems look insurmountable, so we had better not transfer it." Then after studying that further and seeing whether we could address those in the RFP, at the fourth meeting we unanimously recommended to the President that we go ahead.

Mr. SCHEUER. All right. Now after the April 20 meeting, Did you subsequently meet with Jim Lynn concerning the proposal to commercialize the weather satellites?

Secretary BALDRIGE. Yes. I had the one and only meeting, the only time I met with Jim Lynn on this——

Mr. SCHEUER. Would you tell us Jim's relationship to Comsat?

Secretary BALDRIGE. What Lynn is?

Mr. SCHEUER. His relation to Comsat.

Secretary BALDRIGE. Well, he is hired by them as a lawyer, a lobbyist.

Mr. SCHEUER. He is counsel to Comsat.

Secretary BALDRIGE. Yes.

Mr. SCHEUER. OK.

Secretary BALDRIGE. He works for Comsat.

Mr. SCHEUER. Can you tell us about this meeting, this discussion you had with him?

Secretary BALDRIGE. Yes. It was exactly as I said before. I thought that we should not let this particular issue die because of

national security reasons without allowing the private sector a chance to see the concerns of the Government and a chance to say whether they felt they could address them. Otherwise, we would be killing it for the wrong reason.

I asked Lynn to get some of his experts together at Comsat and our DOD and CIA people together, or DCI people, and let them thrash it out.

What they decided, what the DOD people and the DCI people decided, was that if they would list these various criteria strictly and if the private sector could address them, their concerns would be satisfied.

Mr. SCHEUER. You agreed, I take it, to form a task force to discuss Jim Lynn's concern?

Secretary BALDRIGE. This was my idea. I agreed to it. He agreed to it, and so did DOD and CIA, because I did not want to see this killed for some bugaboo in a closet that perhaps could be handled, and perhaps it could not, but there was only one way to find out.

Mr. SCHEUER. Who selected the membership of that task force to meet with Jim Lynn?

Secretary BALDRIGE. I believe the way it worked was that I asked our Cabinet Council secretary to probably get together with NOAA. I think I said to get DOD, DCI, and whoever else was interested in security together. They chose, those agencies chose, their own representatives, if that is what you mean. We did not pick them.

Mr. SCHEUER. All right. Now on May 18, Jim Lynn met with the task force in John Byrne's office, the Administrator of NOAA. Can you tell us what happened at this meeting?

Secretary BALDRIGE. NOAA gave the Comsat people a paper outlining their principal concerns regarding the transfer, the reason that we had thought this could be too risky principally in the area of national security. Therefore, they understood why this was worrying the Cabinet Council.

Mr. SCHEUER. According to a memorandum prepared by one of the participants, Mr. Collamore, it was apparently decided that the next step, and I quote here: "The next step was for Mr. Lynn to be provided with a paper which identifies the specific reasons for leaving Metsat," that is, the weather satellite, "where it is."

Why was this the next step?

What I am trying to ask is this: Is it routine procedure for corporate proposals which have been rejected by the Cabinet Council to receive this type of resuscitation? Do you know of any other instances where a similar review was commenced?

Secretary BALDRIGE. I do not know any, Mr. Chairman, and I do not need any. I thought that was the right way to run this Cabinet Council.

Here we are, first, without enough knowledge. Then we have enough on everything but the national security aspect, which actually was not viewed as a problem in that second Cabinet meeting. I was the one that brought it up and actually pushed for this 30-day study by these people. Then the third time, when that study came out, it looked like security would put up too many problems so we should not do it. At that time I thought, as a question of judgment, that we should give, before we threw the whole thing out, we should give the private sector a chance to see if they could con-

vince DOD and DCI that it was possible to answer their questions, and that is in fact what happened. I think that was a very practical, businesslike approach.

Mr. SCHEUER. Was any other private sector corporation invited to participate?

Secretary BALDRIGE. No. At the time we sent out the request for information, where we had 14 to 16 answers, 1 of the 3 points was this national security point, so everyone had a chance to address that in their own way.

Mr. SCHEUER. Including Comsat, I presume?

Secretary BALDRIGE. Yes.

Mr. SCHEUER. Subsequent to getting all those answers, Comsat seemed to be your chosen instrument for judgment, for consultation, for reactions. I am not saying that critically.

I want to make one other thing clear. Mr. Jim Lynn's name has come into this. I consider Jim Lynn an outstanding public citizen and private citizen. I have known him for years, when he was Secretary of HUD, when he was head of the OMB, and I know of no finer public citizen, private citizen, and practicing lawyer than Jim Lynn.

He was representing a client, and he did it quite properly and I am sure very effectively, perhaps too effectively.

What I am wondering about is why Comsat seems to be the only private sector corporation which you seem to be bouncing your ideas off. The implication of that——

Secretary BALDRIGE. I would not call it "bouncing my ideas off" of them. I would put it this way, Mr. Chairman: Comsat, for this particular purpose, and recognizing that the RFP places everybody at the same level or gives everybody the same start, Comsat had been more active in this and had had experience in other kinds of satellite endeavors than anyone else had to this point. What we were talking about here was chiefly a question of, is it possible technically, if management had a will, to address the national security problems that were very technical and complicated. That is why I went to him. They had a head start in that particular area on having at least been thinking through some of those processes.

This was not—it could not in any way—giving them a head start or any advantage on the final RFP. There is just too much time between everybody's looking at the RFI and this, the RFP.

Mr. SCHEUER. The RFI is a request for information and the RFP is a request for proposal, just for the record?

Secretary BALDRIGE. Yes.

Mr. SCHEUER. According to Mr. Collamore's memo of May 18, 1982, after the submission on the Comsat rebuttal, "the Secretary will then make the decision." This is a quote from Mr. Collamore's report.

What decision were you to make at that point?

Secretary BALDRIGE. I am not sure. I make quite a few. Where is that in his notes?

Yes, now I see it. I imagine that would be the decision whether to bring this back again to the Cabinet Council, if our problems were enough cleared up so that we thought it was worthwhile bringing it back to the Cabinet Council, but I cannot be sure by reading this. That is my guess.

Mr. SCHEUER. All right. Mr. Secretary, on July 14——

Secretary BALDRIGE. I was just reminded that we did appoint an advisory committee after that to look into that.

Excuse me, Mr. Chairman, you were saying something.

Mr. SCHEUER. On July 14, 1982, Comsat submitted its response to NOAA's Issues Paper. Did you take any action following receipt of this material?

Secretary BALDRIGE. I do not know exactly what I did on July 14 or any particular date. I know that when I was satisfied that it was—from our NOAA people who informed me of this—that it was possible to satisfy the security requirements about which we had been concerned—now that does not mean it would be probably or any company or series of companies would actually do it, but they had the ability to do it if management wanted to do so—then I was able to bring it back and recommend that it be put on the Cabinet Council, but I do not know the exact date.

Mr. SCHEUER. At this point in time—that is, in July 1982—I take it that the decision of the Cabinet Council that the weather satellites not be commercialized was still in effect?

Secretary BALDRIGE. Yes. The recommendation——

Mr. SCHEUER. All right, the recommendation of the Cabinet Council.

Secretary BALDRIGE. However, the recommendation had not been made to the President. It was the sense of the Cabinet Council, and the next step in the process, to bring it to the President, had not been decided. We did not decide at that meeting to recommend this to the President. It was just the sense of the Council at that time.

Mr. SCHEUER. As of April 20, it was the sense of the Council that the weather satellites not be commercialized, and I take it that was still in effect, that sense of the Council, in this July period?

Secretary BALDRIGE. Yes.

Mr. SCHEUER. OK. We will come back to this a little later, but I do think, in fairness to my colleagues, we ought to move on.

Therefore, I recognize Mr. Volkmer, who has 10 minutes plus half of the unused time of our two distinguished colleagues.

Mr. VOLKMER. I have several questions, Mr. Secretary.

I would like to start out with this: In the concept of commercializing the Metsat operation, I know there is some concern among some people, and I would like to know if in that concept you envision the commercialization of the National Weather Service?

Secretary BALDRIGE. No. In no way, shape, or form. I think that that started by some unfortunate reporting. Maybe there—and I do not even know how the reporting got started. I do not want to blame the press on this.

Mr. VOLKMER. Let's go back to the report that I was reading which I was furnished yesterday evening, the Halbouty report, which on page 4 says:

> A large market for weather satellite data might be developed, but the National Weather Service would have to be commercialized before it can be tapped.

That is in the Halbouty report.

Secretary BALDRIGE. Well, that is in the Halbouty report, but——

Mr. VOLKMER. Is that possibly the source of the problem?

Secretary BALDRIGE. It could be. I do not know, but I will tell you that I get all kinds of reports, all kinds of advice, but the buck stops with our recommendation to the President. I have never envisaged—and we as a Government have never envisaged—selling the National Weather Service.

Mr. VOLKMER. You do not envision any request for proposal to include any such proposal in itself?

Secretary BALDRIGE. Never, and would not now.

Mr. VOLKMER. Thank you very much.

I have several other concerns, as I am sure other members of the committee do.

I especially appreciate what you said on page 8 of your statement—which you did not read—what you have well said here in answer to the chairman of the full committee, the gentleman from Florida. You said you would keep the Congress informed, consult with us and work with us. I appreciate that.

However, when I come down to where we are now, it appears to me we have some things that have already been decided that maybe the Congress should have had a little bit to say about already. What I am hearing is that the commercialization request for proposal would probably include one part for weather satellites, one part for Landsat and land sensing, and one part for a combination.

Secretary BALDRIGE. Each one separately. The Metsat separate, the Landsat separate, or a combination of the two.

Mr. VOLKMER. Have we therefore completely discarded the notion—in the Landsat operation—of the Government continuing to operate the satellites and providing raw data and commercializing everything downstream from that?

Secretary BALDRIGE. I would put it this way: There should be enough flexibilities in the RFP when we send it out—and, as I said, we will consult with the Congress on that—so if someone wants to bid that way, they can take their chances on it. If they can prove to us that that is the best of all worlds, I think we should consider it. However, it depends on how we write up the RFP.

That particular option was not received with a great deal of enthusiasm as a possibility, simply because that would leave the cost of the satellites in the U.S. Government's hands and, in effect, the whole rest of it in private sector's hands. If the private sector can really expand the data enhancement, the data gathering, and distribution, the marketing of it, and make money that way, they should, in my opinion anyway, be involved with running the satellites, absorbing that cost.

Mr. VOLKMER. However, isn't it pretty well granted, at least by most of the studies, that the Landsat operation by itself would not be viable for a private investor for a number of years, maybe up to 10 years?

Secretary BALDRIGE. I think that is——

Mr. VOLKMER. The total operation.

Secretary BALDRIGE. Yes. There is a general consensus that it would be somewhere between 8 to 10 to 12 years before Landsat would be profitable.

Now there is another alternative that may come in when the RFP comes back. That is companies that may want to put up their

own version of Landsat and not have anything to do with our Landsat. That is another possibility.

Mr. VOLKMER. The other thing I see as I am trying to review the whole question is that there is concern about what is going to happen with respect to competitors from Japan and France, et cetera. Then I look at their operations, and it appears to me that their operations are only going to concern themselves with Landsat and not weather satellites.

Secretary BALDRIGE. No, sir. The Japanese are proposing an ERS satellite that will—if it will do what they say it will, and I think we have to assume that it will—it will be day/night, all weather, land-remote sensing, which would be ahead of anything we have

VOLKMER. However, it is still land-remote sensing? It is not a weather satellite for the weather——

Secretary BALDRIGE. Oh, no. That is more comparable to our Landsat.

Mr. VOLKMER. It is a land-sensing program?

Secretary BALDRIGE. It is the land-sensing program.

Mr. VOLKMER. That is what I mean. The foreign competition does not now involve weather satellites?

Secretary BALDRIGE. No. They have another satellite that will be specifically used for ocean sensing that actually could be economically worthwhile or competitive before any of the others are. There is a great need for that in the ocean. We do not have one now.

Let me ask Dr. Calio if any of the other countries that he knows of are thinking of putting up an equivalent of our weather satellite.

In Europe and India now there are Government weather satellites up, and Japan, but not——

Mr. VOLKMER. However, they are not for commercialization?

Secretary BALDRIGE. Not for commercialization.

Mr. VOLKMER. That is what I wanted to get to. What I am trying to get to is that so far we are the only country that is looking at the concept of commercializing the weather satellites.

Secretary BALDRIGE. That is probably true.

Mr. VOLKMER. Let's go back to the ones that are commercializing or propose to commercialize the land-sensing or ocean-sensing satellite function. Will those be government-operated satellites with the raw information then available for commercialization?

Secretary BALDRIGE. Would you mind repeating that, Congressman? I did not quite get it.

Mr. VOLKMER. The question is, in those countries you mentioned, which seem to give some momentum to what we are doing because of what they are doing, in their operations; that is, Japan and France, would the satellites be government-operated, remote-sensing satellites furnishing raw data to the commercial sector for promotion and sale?

Secretary BALDRIGE. Yes. In the case of the French, they have a consortium with the French Government and also there are private companies investing in this area. The private companies would handle the marketing of it. They would try to market that around the world.

Mr. VOLKMER. What concerns me a little bit is that in the other countries with which we are going to be in competition, it appears

that there is going to be considerable amount of subsidy in the remote-sensing Landsat concept. If we go to the private sector completely without subsidy, the question is will they be able to compete?

Secretary BALDRIGE. Exactly.

Mr. VOLKMER. Now if the Government continues to provide the raw data and makes a commitment to that, so that our commercial sector at first would only have to expand the use of it, which we are looking for, then wouldn't they be able to compete a little better?

Secretary BALDRIGE. That is possible, but the U.S. Government would, in that case, keep on forever theoretically bearing the cost of running their own satellites.

Mr. VOLKMER. Let me take it one step further and ask this: As that commercial market developed, which we hope it would do, perhaps down the road someone in the private sector would be able to see that they could also provide the satellite function?

Secretary BALDRIGE. Yes; that is possible.

Mr. VOLKMER. The other thing—and then I will quit. I have a lot of questions, but we can go around and then I can come back.

The other thing that concerns me is that we make sure when the RFP's are proposed that we are not providing for a monopolistic-type of operation, guaranteed by the Government in any of these areas. Do you agree with that?

Secretary BALDRIGE. I certainly do.

Mr. VOLKMER. That we promote the idea of competition?

Secretary BALDRIGE. Absolutely. Otherwise, there is not any use in going through this exercise.

Mr. VOLKMER. Thank you very much, Mr. Chairman. I yield back the balance of my time.

Mr. SCHEUER. Mr. Bateman of Virginia?

Mr. BATEMAN. Thank you, Mr. Chairman.

Mr. Secretary, I have listened to your testimony, which I find very direct, candid, and refreshing. I would articulate what I understand the decisionmaking process at this point to be: there is not really a decision that we shall commercialize anything, but a decision that had to be made that we shall afford an opportunity for commercialization if it should prove feasible with respect to a mix of public policy concerns that include the foreign relations aspect of it, the defense implications of it, as well as the implications to the taxpayer, of commercialization. Would you say that is a fair statement of what has, in fact, at this point been decided?

Secretary BALDRIGE. Exactly.

Mr. BATEMAN. Obviously, then, it would seem to me that there is much speculation as to anything that may hereafter occur. But until you have specific standards, criteria, and conditions spelled out governing the substance of a proposal, one necessarily must do some speculating.

I have been doing my share of speculation, even in advance of your testimony, Mr. Secretary.

I return to the text of your statement, at the bottom of page 3. It affords some basis for speculative concern.

The context of it is that the main reason for allowing the private sector to bid on weather satellites is to provide a revenue base that

a private operator needs to take on the cost of developing private commercial markets for data generated by the systems. This seems to speak some substantial view that the one system cannot carry its own weight commercially but, if you throw in the other, together they can.

That leads to this mix of concerns on my part. Let us take as a given that the National Weather Service will not be commercialized and that it is the prime user of the meteorological satellite data, something like a 95 or 96 percent governmental utilization there, and the remaining user, except for a very negligible percentage, is defense. Is the Weather Service, which is not going to be commercialized, going to be paying the private operator, if we assume that this goes forward, for the data that they obtain?

Secretary BALDRIGE. Yes. We did not want to take anything as a given in this whole bidding process. It is possible that the Landsat, for example, would not be economically attractive for the private sector for, as I said before, 6, 8, or 10 years. Nobody knows.

It is possible that if weather satellites were included with the National Weather Service getting exactly the same data in exactly the same form, they would see no change at all. What we are paying for that now, we would pay the same amount to a private company. However, that company would then be able to expand the marketing of some of those weather services and gain future income from that which would allow them to make the whole thing not only worthwhile, but create a new industry which would provide new jobs. The Government is not in the business of marketing. We are very poor marketers. We think that the innovativeness and ingenuity of the private sector could provide a whole new industry here.

Until we see the answers to the RFP, we simply will not know that. I do not like to take any givens on this exercise. That is why I think we have looked at this off and on for 5 years now in one form or another. I do not know of any other way to find out the answers to these questions without going through an RFP.

To get back to the more narrow point, I cannot imagine the RFP being written any other way—of course, you will have a chance to see this—than to provide for the National Weather Service getting exactly the same kinds of benefits, the same kinds of programs, and so forth, as they are getting now. It just would be a different provider.

Also the RFP should clearly provide for our ability to monitor the fact that the whole process, both weather and land, is keeping up to the state of the art, so that we just do not stand still. As the state of the art improves and the market improves, we would expect to see the services improve also, as they have been doing in the past.

Mr. BATEMAN. Mr. Chairman, if I have time for another question? As I have tried to project a commercialization scenario, one of the concepts suggests that in the nature of things, given the expense of the equipment, the satellites, the ground systems, and so forth, competition from a number of companies or entities providing the same service may not lend itself to the normal competition of the marketplace. Franchising, in effect, as in the sense of a public utility, might be required.

Has any thought been given to the kinds of regulatory constraints such as pricing structure that would be necessary if it proves out that it must be a franchise or exclusive operation as opposed to an open-market, competitive frame of reference?

Secretary BALDRIGE. Yes, Congressman. We are working on that and are addressing that concern in our proposed RFP. You will have a chance to see that before they are sent out.

Mr. BATEMAN. Mr. Chairman, I have one final and very brief question.

There is an obvious congressional interest in this. You, sir, have made it more than clear that you invite, solicit, welcome, and encourage comment and mutual communication on this. However, I would strongly suggest that in the kinds of communication that go forward from the Department to industry that industry be, in a sense, forewarned, though most of them are more than sophisticated enough to read and follow the status of the law, but I think there ought to be at least some gentle reminder to them that in what they are doing, there is very definitely an interest here in this very diffuse body called the Congress and that perhaps they should be aware of that at the front end rather than finding themselves surprised at a later point.

I certainly do not offer that suggestion in a sense of trying to have a chilling effect on people making a proposal, but I think it would be very good that they be forewarned.

I thank you, Mr. Chairman.

Mr. SCHEUER. There is a unanimous-consent request from one of the Members that picture-taking be permitted in the chamber. If there is no objection, so ordered.

Mr. Andrews?

Mr. ANDREWS. Thank you, Mr. Chairman.

Mr. Secretary, I want to thank you for coming this morning, and I appreciate very much your presentation.

I guess one of my primary concerns is the national security ramifications. I am sure you share some of those concerns.

I wonder if you would list for us specifically some of the problems that you would see as they relate to national security and how you think those problems may be overcome.

Secretary BALDRIGE. There is no way I can list them all or even know them all, because that is DOD and the Director of Central Intelligence that have that job. However, I can give you some of them to give you a flavor of the kinds of things at which we are looking.

Mr. ANDREWS. Sure.

Secretary BALDRIGE. How do we, the U.S. Government, the Department of Defense, preempt the service of these satellites during national emergencies and how do we get them back? If we declare a national emergency, just physically how do we take them back? What steps do we go through?

How do we give priority service for whatever special defense needs there are either in times of emergency or during normal times when there is not an emergency?

How do we screen any plans that the private sector may have, for new sensors on satellites to insure that sensitive information will not be detected by them.

We would have to have oversight over private sector operations to insure that previously approved sensors do not have either unforeseen applications—unforeseen at the time we OK'ed them—or have the capability to detect sensitive information through the use of new data processing techniques.

These kinds of contractual terms, as well as many others, would be prepared by the DOD and the Director of Central Intelligence representatives on our drafting team. We have an interagency team to draft the RFP. Those terms will be prepared by DOD and DCI, and they would be reviewed by members of the defense and the intelligence communities on the policy level Interagency Board on Civil, Operational, Earth-Observing Satellite Systems [IBCOESS]—if that acronym helps—and approved by the respective heads of their departments.

We think after studying this this far, and we have agreement from every other Government agency at the Cabinet level, that this will be able to address that situation all right. In the final analysis, this is important enough so that—when you talk about the DOD, you are talking about their interagency representatives here, but unless the Secretary of Defense is satisfied with it, I am sure he is not going to sign off, knowing him as I do.

Mr. ANDREWS. That is a good point.

Secretary BALDRIGE. I would bring up one other point, Congressman.

In other areas private sector employees and firms operate some of the most sensitive systems in our national defense. This would not be the first time this has happened. It is already done in other areas, and there are appropriate safeguards, and we have had experience with this.

Mr. ANDREWS. Are you confident, Mr. Secretary, that these problems can be overcome?

Secretary BALDRIGE. Nope. I do not know. We will not know until we get the RFP and get the full interagency review. That is why when I began here today I said I do not have any preconceived notions. I have two. One is we ought to keep ahead in this field, and the other is I am not going to believe anything unless I see somebody sign their name to it, agreeing to whatever we feel they have to agree to. Otherwise, everything else is blue sky.

Mr. ANDREWS. Thank you.

Thank you, Mr. Chairman.

Mr. SCHEUER. Congressman Walker of Pennsylvania?

Mr. WALKER. Thank you, Mr. Chairman.

I have been interested in a couple of the remarks you have made. I would like to give you an opportunity to amplify on them because it seems to me that we around here will find all kinds of ways, all the time to keep Government involved in all these matters. Some of your statements, I think, have been most useful.

I am amazed, for instance, when I hear people talk about the fact that this one area, this weather area, ought to be kept in the hands of Government for all kinds of good reasons, and yet we allow private enterprise literally to disseminate every other bit of information in this country. When I watch a news show at night, the only information coming across through that news show that is Govern-

ment controlled is the weather. It also tends to be the most inaccurate.

Secretary BALDRIGE. Now, Congressman——

Mr. WALKER. I am making that statement; you are not, Mr. Secretary.

Secretary BALDRIGE. We have the best weather service in the world.

Mr. WALKER. Well, that is fine, but I am saying that if we can find ways to provide new opportunities in all of this, I do not think that we ought necessarily to say that we need a lot of roadblocks toward getting there.

Let me ask a couple of questions in that vein. Is there any possibility that it would not be in the best interest of NOAA to support a decision for transfer?

Secretary BALDRIGE. In the best interest of NOAA?

Mr. WALKER. Right.

Secretary BALDRIGE. You mean from a parochial——

Mr. WALKER. Essentially, yes.

Secretary BALDRIGE. The reason I pause there is that I view NOAA as part of the Commerce Department. Whatever in my position I decide is the position of the Commerce Department, that is it, and that includes NOAA. If we understand that, and NOAA is part of the Commerce Department, then we get down to if you or I were working in NOAA, would it be—would we feel that it would be—in our best interest to support a transfer such as this? I think that probably there is some apprehension because of some of the points that have been brought up here today about what will happen to jobs. That comes with any change. It is brought about by the fact that through these studies—I believe it was the chairman who asked me about them earlier on—we are making a whole governmental survey about what could be best put back to the private sector, and that has caused obviously, some apprehension because people do not know the final outcome yet.

Mr. WALKER. I guess what I am saying, though, is I am not as concerned about it in that narrow sense as I am about the mission of NOAA. What I am saying is, are we dealing with an eventuality here that somehow the mission of NOAA will be jeopardized by proceeding toward transfer?

Secretary BALDRIGE. No, I do not get that feeling at all. Dr. Calio, who is a space expert and Deputy Administrator of NOAA, is right here by my side. He knows he can answer as frankly as I would any of these questions. If you would like to ask him, he is closer to it than I am.

Mr. WALKER. I asked that question because there has been a lot of controversy. We have had an overwhelming amount of criticism and debate about it since it was announced.

Can you assure us, for the record, that citizens will not be paying $5 for a sunny forecast and $15 for a hurricane?

Secretary BALDRIGE. A hurricane is worth more than that. [Laughter.]

I do not want to be facetious about something that important. We clearly are not going to charge people for weather services as a result of the kind of transfer we are talking about here. Now we may get into some areas—and I know there are some differences of

opinion on them in this room—on things like fruit frost warnings, and so forth, that are part of another study, but that has nothing to do with this transfer.

If you accept those and put those to one side, the transfer itself would make not one bit of difference to the user of weather information.

Mr. WALKER. That being the point—that there has been a suggestion along the way that somehow the public is going to have an adverse impact from changing the NOAA mission as a result of this. That the public is going to see a change in the weather format. In fact, couldn't it very well be, that the public will see an improvement in this because we are likely to see a lot of innovation that does not otherwise take place because of a virtual Government monopoly?

Secretary BALDRIGE. That is my belief, but I agree with you that there has been enough misinformation out. I chose to handle it in one way, and maybe it would have been wise to do it another way.

When the announcement was made about the President's decision, I read 15 editorials the next day saying how wrong that decision was and I read probably 35 newspaper reports by reporters who had never seen the inside of a weather station and did not even know what we were talking about, and I was in the position of either answering those one by one, or having Dr. Calio, or else letting the dust settle and come down here and speak myself. That is what we chose to do. However, I hope this lays that misinformation to rest, because there has been a great deal of it.

Mr. WALKER. Let me look at a couple of other subject areas.

Would selling the land and weather satellites increase or decrease the cost to Government in the immediate future?

Secretary BALDRIGE. We will not know until we see the responses to the RFP. I do not want to overemphasize that point, but I do not know how I can overemphasize it. I do not believe anything until I see what comes in with somebody's name signed to it. The rest of it is sheer conjecture. I would not want to involve us in that.

Mr. WALKER. All right. Let me look at it from another side. Is the potential there for increased or decreased revenues to the Government in the future?

Secretary BALDRIGE. I think we have to separate a question like that and your previous question into what is short term, what is medium term, what is long term, and wherein lies the best interest of the taxpayer and our country for all the other reasons we have laid out.

It is possible that it could cost the Government more for a period of 5 years, or 10 years, or 15 years, or 50 years, and we would have to make a decision with the Congress based on that. It is possible that it could go the other way.

My own opinion is that it could cost the Government more for a short period of time, and if that period of time is short enough, you ought to look at it seriously. If it is too long, we ought to wait.

Mr. WALKER. To go to the other side of the question, though, it does offer the opportunity for some increased revenues because of the commercial activities; isn't that correct?

Secretary BALDRIGE. Yes.

Mr. WALKER. That would have to be weighed against any increased cost?

Secretary BALDRIGE. Absolutely, and you make that point better than I did, Congressman.

Part of weighing the responses to the RFP should be the chances of the creation and the growth of a new industry that this would promote. I think the possibilities are very definite in that area. It is difficult to assess them. We would have to wait until the responses come in to do it and see what the plans would be.

Mr. WALKER. Thank you, Mr. Chairman.

Mr. SCHEUER. Mr. MacKay?

Mr. MACKAY. Mr. Baldrige, I understand that the Landsat program was originally a research program. It was assumed that the data would primarily be useful to geologists, meteorologists, and others, and it was a basic research program. My understanding is that Landsat I, II, and III have been producing data now for almost 10 years but that the basic research is still not completed. They still do not have their baseline data set completed.

Landsat IV has a new sensor on it which has produced some spectacular results, but it also has not completed the basic research data. In the process of doing that basic research, it has become apparent that there is a tremendous amount of peripheral use that could be made of this data.

My understanding is that it has been a policy all along that this mechanism would be transferred into the private sector at some time. The Carter administration contemplated 15 years. The Reagan administration first said we would do it by 1988. What has now been said is, no, we will do it by 1984. The real question in my mind is not whether it should be done. The real question is whether this policy change—and I will call it that, and you may want to comment on that—whether this policy change makes sense.

The basic research is not completed. The apparent transition would take 1 or more years. The cost to Government, although you say we will not know that until we get the private sector estimates—we do have public sector estimates which seem to indicate the cost may go up. I agree it would be nice to have both, but my question is, Have we not somehow lost track of the original problem we set out to solve, which was to do basic research, which is one of the questions that this committee is interested in? We are not a military committee primarily. We are a basic research kind of committee.

My concern is this: That suddenly a very valuable basic research tool may be lost or the program may be put in jeopardy because of the policy change. I would like you to comment on that.

Also, what standards do you use in determining when such a transfer should take place from basic research to privatization?

Secretary BALDRIGE. Congressman, if you had dealt—and maybe you have—with as many scientists and research committees as I have in the past 25 years, you would know that the answer to your question is that basic research is never done. You never will get anyone interested in that area to say that the basic research is over. It is just a fundamental view that, if I were a scientist, I would have, too.

Mr. MACKAY. I share that suspicion. However, as I say, we do not yet have a baseline set of data. Is that not a fairly objective indication that they are right?

Secretary BALDRIGE. Yes, but you could get scientists to agree that we do have it. There is no unanimity of thought in that area.

Again, we are talking about a difference of time. It has been contemplated for at least 5 years, and perhaps longer than that, but documented for 5 years that at least Landsat and, somewhat later, the possibility of Metsat should be looked at with a view toward returning to the private sector.

So, the policy has been rather constant. As you point out, the timing has changed. We feel that there has been enough basic kind of research done and it is time to look at transferring it to the private sector now. When I say "now," by the time we get the RFP and the studies done, and so forth, you are talking about in the next year by the time they will be in. We feel it is time.

However, I would grant you that there is a legitimate argument that could be made on both sides of that question.

Mr. MACKAY. I am intrigued by the thought that you should also be putting out RFP's on the space shuttle. The same rationale would justify that, would it not?

Secretary BALDRIGE. I am not an expert on the space shuttle. Dr. Calio, do you want to comment?

Mr. MACKAY. I am asking, is this your policy? Is this your policy? If so, certainly the private sector—we have demonstrated that it is feasible; we have demonstrated phenomenal potential, someday commercial use, and there may be a single user, given sufficient subsidy, that could operate the space shuttle and it might get the commercial use of this technology expanded at a more rapid rate. If we are going to do this, what is the matter with that?

Secretary BALDRIGE. I do not see anything wrong with the theory of it. In practice and where the two technologies are and where the basic research is, I think there is a real difference.

Mr. MACKAY. However, we will never know unless we send out a request for proposal?

Secretary BALDRIGE. All right. That is probably true.

Mr. SCHEUER. Mr. Tom Lewis of Florida?

Mr. LEWIS. Thank you, Mr. Chairman.

Mr. Secretary, you have answered this in several ways, but I want to ask you the question again. I am very much concerned that we do not compromise our DOD requirements as far as going to the private sector even with an RFP. How are we going to have protection against that? What are the safeguards that will be used so that our defense mechanism will not be jeopardized. If in a time of emergency they had to reclaim these satellites, how would that be handled?

Secretary BALDRIGE. I think the clearest, direct answer to your question is that unless Secretary Weinberger and Director Casey are convinced that those are being addressed, we will not go ahead. Having started off with that broader statement, the way that gets accomplished is by interagency participation with DOD and DCI first agreeing on the kinds of security problems that need addressing and then getting down to the specific point-by-point part of the

proposed RFP that they would include that companies would have to answer.

Part of that would be, I am sure, onsite inspection of the facilities, the personnel, and so forth, to make sure that the U.S. Government is not just looking at some words on a piece of paper but the actual management and technical ability to back up whatever statements they make.

Mr. LEWIS. Following up where Chairman Volkmer raised a question, I also have a concern when you go out with an RFP, since according to your statement, we have France, Japan, Canada, and Germany, the European Space Agency, India, and the Soviet Union all actively developing satellite systems and remote-sensing systems. How can a private sector compete in this area? I understand we do have an international agreement whereby we collect data from these satellites. How can a private sector company compete with these countries that are actually continuing to pay for the overall expense of these operations?

Secretary BALDRIGE. That is up to them, Congressman. They know that as well as you or I do. They factor that into any bid they put in.

The other countries all use complete or partial subsidization. In the case of France, as I pointed out before, they have private companies that have an investment in their new spot satellite. If you or I were running one of the companies in the United States and got one of these RFP's because we were able to be included in those who would bid on it, we would certainly have to figure out the answer to your question and factor that in.

Mr. LEWIS. By factoring that in, then, that would really, in my judgment, increase the cost of these services to these people when they could get the services cheaper from someone else because they are being subsidized. Does our Government or does your plan look at subsidizing the private sector in this area?

Secretary BALDRIGE. No, but that is what we will find out when the RFP's come in. We will get that answer then, and only then. That is why I do not like to conjecture ahead of time. The proof of that pudding will be in the eating.

It may well be—I do not want to prejudge this at all—it may well be that we will not get any bids that we feel address all of the concerns we have talked about, plus make it a good deal for the taxpayer.

However, I also might add that the U.S. industry competes with subsidized entities around the world now and has for 10 or 15 years. Just because a particular country decides to subsidize a government effort in a particular area does not mean that they are going to come out as a winner. I have seen some that do, but I have seen an awful lot that do not. That is not necessarily the best way for efficiency or even the highest technological advancement.

Mr. LEWIS. One final question, Mr. Chairman.

Mr. Secretary, do you feel that firms would be reluctant to submit proposals knowing that legislation would be considered after their response rather than having the policy set forth before the proposals?

Secretary BALDRIGE. I suppose some might. I say that because it will not be inexpensive to make a proposal along the lines we are

talking about, to do the job right. They are taking the risk of investing some funds in making a good proposal and then having Congress and the administration—but it finally will get down to legislation not being passed by Congress. If the legislation were passed ahead of time, that would perhaps alleviate that fear for some of the companies.

I really do not know how to answer your question definitively, but my guess would be that it would have an effect on some people who are potential bidders, but I do not know what to do about it. We do not want to do this by Executive order. As a matter of fact, I am not up on the law of it, but I do not think we could if we wanted to do so. I think this is a congressional prerogative and would take legislation.

Mr. LEWIS. Mr. Secretary, I have sat through several hearings in my new term in Congress, and I want to tell you that I appreciate your straight and forthright answers, but I also would like to ask this: What is your recommendation? It seems that releases are coming out that are criticizing the administration, and I believe most of the time it is the administration's fault. What would be your recommendation now that you have a study and you are asking that this be looked at and reviewed, while the press, from your own admittance, has come out with what you are going to do and what you are planning on doing? How do you feel that this can be prevented so that the people know that you are only taking a look at this, that this is a study aimed at coming up with a proposal, rather than going through all this balderdash?

Secretary BALDRIGE. I do not think you can help having your past experiences color your present judgment. A very wise man once said that good judgment comes from experience but experience comes from bad judgment.

Mr. LEWIS. That is true.

Secretary BALDRIGE. My experience in the Government has shown me that, because of the system and checks and balances that we rightfully have in the Government, we are geared up to stop bad things from happening rather than being geared up to make good things happen. There are more ways to delay and study and restudy issues and years go on.

This idea has been around for five years. This administration is the only one that has actually faced up to doing something about it. As a result, we have taken our share of flack on it, and that is part of the process and it should be there.

However, my recommendation, without pretending to be an expert on this when I first came down here, but after 2 years, is that in all of the surveys and studies that we see there is enough uncertainty about the outcome. People here will say that most of these studies have recommended against it. If you study them carefully, what they are saying is the normal, cautious kind of reservations, that it would appear that—and all kinds of caveats—I am left with the impression that nobody really knows.

I do not know any other way to handle that problem except the way we are proposing, that we proposed to the President, that we go out and actually find out whether it is a good idea to transfer this to the private sector, what they will come up with.

When we review the response to the RFP, we will be having an entirely different kind of discussion, where we are talking about facts; we can get down to the kinds of direct organizational studies, marketing studies, scientific studies to help us in forming that final opinion. However, right now we are still wandering around in the land of conjecture until we take the action that we have proposed.

Mr. LEWIS. Thank you, Mr. Chairman.

Mr. SCHEUER. Mr. Baldrige, to continue picking up the thread of process that we were on before, in September 1982 the Department of Commerce invited the private sector to present their views and expressions of interest, an RFI, in the ownership or the operation of the civilian weather and land satellites. Now why at this time, in the face of the still standing Cabinet Council on Commerce and Trade position against the transfer, did you decide to seek a request for information in September 1982? What had happened in the meantime for you to make this decision?

Secretary BALDRIGE. What had happened between, let's say—before December 1981—between when and December 1982?

Mr. SCHEUER. On April 20 1982, the Cabinet Council made a negative report. They recommended against the Metsat transfer. Now at this time you are deciding to seek an RFI to the private sector to present their views and expression of interest in such a transfer.

Secretary BALDRIGE. Mr. Chairman, if I may say so, I think you are making too big a point out of that, but I will bore you to death with details if you would like.

Mr. SCHEUER. Just briefly. You do not have to bore us for long.

Secretary BALDRIGE. All right.

Mr. SCHEUER. You have not bored us at all this morning so far.

Secretary BALDRIGE. Let's remember that in the Cabinet Council meeting before that third one when we made the decision you mentioned we had decided to include them. Therefore, you could ask the same question, why did we revisit the issue on April 20 when on March 17 we had effectively said that weather satellites should be included? At that time I wanted to postpone the final action for 30 days until we could review the security parts of it.

After this meeting that you are talking about on April 20, we decided that the weather satellite should not be transferred to the private sector "at this time." We also decided to explore—I do not like this word but let me use it—the "privatization costs" of transferring Landsat to the private sector——

Mr. SCHEUER. That is a truly dreadful word. I agree with you. It is an anathema.

Secretary BALDRIGE. To investigate the means by which Landsat capability could be continued following the currently procured satellites, and we also agreed to investigate a Japanese proposal for a joint venture. We agreed on—all of those things came up.

My feeling, as I told you earlier, was that we should probably not throw out the weather part as long as we were going to continue to explore these other areas and had not made a final decision, not made a recommendation to the President. We had not decided to make a recommendation to the President. We should keep open the weather part only if we could show that national security could be addressed. We were making an assumption that it could not, and I did not think that that necessarily was the right assumption, just

like I did not think at the second Cabinet meeting that we had given enough attention to national security.

Mr. SCHEUER. Mr. Secretary, on September 3, 1982, Deputy Secretary of Commerce Fiske requested that a preamble be added to the Request-for-Information, which was scheduled to be published in the Commerce Business Daily. I would ask you to review two documents. The first is Mr. Fiske's draft preamble to the RFI, and the second is an excerpt from Comsat's Earth-Star Update of March 15, 1982. You have those documents that we provided you.

Secretary BALDRIGE. I think that paragraph is the same.

Mr. SCHEUER. It is exactly the same. Now doesn't that strike you—the fact that it is the same, and I think we have agreed on that. I would ask your view as to whether it is appropriate for Government to be lifting *in haec verba*—in exact words—the exact phraseology, a paragraph, as an element in the preamble.

Secretary BALDRIGE. As you know, Mr. Chairman, I think that it is frequently done. If it is legal to lobby, and it is, unless we want to stop that, there are going to be ideas taken from various lobbyists.

Mr. SCHEUER. Now let me ask this: Was this draft document submitted to other private sector firms for their suggestions as to language that should be deleted, added, or changed? You submitted i t to Comsat. Did you submit it to anybody else?

Secretary BALDRIGE. I would say on the RFI, the request for information that we put out, we got back, as I said, some 14 or 16 papers there, and they were all reviewed.

To answer your question directly, I do not happen to think it is proper to lift exact language. I do not know how you can stop taking ideas, if you think they are good ideas, no matter where they are brought up. However, in this particular case, it is a preamble. It is kind of a statement of general thrust of what is going to come afterward. It has no substance as far as a difference between one company or another.

Mr. SCHEUER. All right.

Secretary BALDRIGE. Actually, as to the difference between the paragraph used and the paragraph it replaced—I cannot find any difference in the meaning. I do not see that it makes any difference at all except cleaning up somebody's opinion of the English language.

Mr. SCHEUER. All right. Let's discuss the facts. All right?

You say it is not a matter of substance. Let's discuss one specific statement that is essentially similar in both documents, both as in the Comsat document and as it was picked up in its entirety and interlaced into the Department of Commerce document.

"It is the policy of this Administration to seek the prompt commercialization of civil weather and land satellite remote sensing, assuming that the responses to the Land Remote-sensing Advisory Committee confirm our present information that commercialization would be economical and in the public interest."

I have two questions to ask you on that. Your current information, your present information, as I understand it, would be most recently expressed in the April 20 Commerce advisory committee, the Cabinet Council on Commerce and Trade statement of April 20 in which they made a direct statement to the contrary. They ad-

vised against transfer of the weather satellites. There was absolutely nothing in that statement that would justify the phrase, "our present information is that commercialization would be economical and in the public interest."

Where in any documentation from any official source do you have—did you have in your possession a rebuttal to the clear statement contained in the April 20 minutes that this transfer would be inadvisable? Where did this come from: "Our present information is that commercialization would be economical and in the public interest."?

It is totally inconsistent with the April 20 statement. Now what happened in the interim that justified that statement?

Secretary BALDRIGE. Mr. Chairman——

Mr. SCHEUER. I would ask at the same time, what happened in the interim that said it is the policy of this administration to seek prompt commercialization of civil weather and land satellites?

Secretary BALDRIGE. The words were "confirm our present information that commercialization would be economical and in the public interest." Now we have never, ever decided up to that point that weather satellites would not be economical and in the public interest. What we had decided at the Cabinet Council meeting that you referred to that preceded this was that national security concerns looked like they could be insurmountable. At least there was some real doubt about that. Therefore, we would not address the weather satellites "at this time."

Now there were several other issues, as I just mentioned, brought up at that meeting, including looking into this with Japan, and so forth, and the words "economical" and "commercialization" seem to me perfectly proper there. We were talking about the national security concerns as a reason, at that last Cabinet Council meeting, for saying at this time the weather satellite should not be included.

Those were in the process of being worked out. The problem was never the economic part that this addresses here. I think this statement is perfectly proper.

Mr. SCHEUER. This statement that was lifted from the Comsat document says: "It is the policy of this Administration to seek prompt commercialization." When did it become the policy of this Administration to seek prompt commercialization?

In view of the statement by the Cabinet Council on Commerce and Trade of April 20, it was not the policy of this Administration to seek prompt commercialization.

Secretary BALDRIGE. It added "at this time." There were still things to look into that had to be assured on national security. The economic part had already been favorably discussed.

Mr. SCHEUER. I do not understand this, Mr. Secretary.

Secretary BALDRIGE. I will find the original paragraph.

Mr. SCHEUER. When did the policy change from April—after April 20? This statement which is in the RFI says: "It is the policy of this Administration to seek prompt commercialization," et cetera, et cetera, et cetera. When did this policy change come about and how?

Secretary BALDRIGE. I can explain this one more time.

We had changed our minds—and I am not ashamed or afraid to admit that, because I think that is the way you——

Mr. SCHEUER. Since April 20?

Secretary BALDRIGE.—work out any complex issue such as this. We had first said that we did not have enough information. We sent the working groups back to work. We secondly said that we should do the weather satellites. I did not think——

Mr. SCHEUER. This was when?

Secretary BALDRIGE. This was at the second Cabinet Council meeting.

Mr. SCHEUER. That was in March?

Secretary BALDRIGE. That was in March.

Mr. SCHEUER. Then you reversed yourself on April 20?

Secretary BALDRIGE. On April 20—and the reason that I held back on the March Cabinet meeting was that I did not think national security concerns had been adequately addressed. Therefore, we took 30 days on that, and that led to the decision for the Cabinet Council to recommend that national security concerns, after we had a classified briefing, were not concerned with just a simple transfer—we had not covered that enough. Therefore, I started the whole process going of seeing if they could be addressed enough.

This particular document is a NOAA document, and I would like to see the original paragraph. Where is the original?

Mr. SCHEUER. Mr. Secretary, let me just clarify things for you. OK?

Secretary BALDRIGE. All right.

Mr. SCHEUER. This statement, this was an original draft of the Request-for-Information, and it said:

> It is the policy of this administration to seek prompt commercialization of civil and weather land satellites, assuming that the responses to the Land Remote-sensing Advisory Committee confirm our present information that commercialization would be economical and in the public interest.

Now, what I am suggesting to you is that it was not the policy of the Administration at that time and they had no present information that commercialization would be economical. You have never done what anybody would refer to as a businesslike cost-benefit or feasibility analysis of the transfer. You were so advised, Mr. Secretary, by NOAA.

Therefore, when the final request for information came out—and here is Mr. Fiske's document. Do we have a copy that we can give to the Secretary? This whole paragraph that I have mentioned was deleted and the paragraph that I am about to read was substituted for that. Here is the paragraph that was substituted for it after NOAA passed on their advice and counsel that this was an inaccurate paragraph that had been lifted from the Comsat document. Here is what was in the final RFI:

> While it is the current policy of the administration to seek prompt commercialization of land satellite remote sensing and retain the civil weather satellites in the Government, that policy will be reexamined if commercialization of both systems is shown to produce cost savings to Federal agencies and questions relating to national security and foreign relations are resolved satisfactorily.

Now that is a great change.

Secretary BALDRIGE. I have to disagree that it is a great change.

Mr. SCHEUER. This says the Government should keep the weather satellites, that there is a rebuttable presumption that they should keep weather satellites——

Secretary BALDRIGE. Mr. Chairman, you have to bear in mind the purpose of this letter. This was going out to people for requests for information on what they would do in the area of Landsat and Metsat. It was asking for their reactions.

Can I continue?

Mr. SCHEUER. Yes, indeed.

Secretary BALDRIGE. This was a preamble to a request for information from these 16 companies I told you about as to what their feelings were about the transfer of Landsat and Metsat.

It was an attempt to elicit information from them as to the feasibility of both of those. In so doing, the difference in the wording of "while it is the current policy to seek prompt commercialization and retain the civil weather satellites, that policy will be reexamined if commercialization of both systems is shown to produce cost savings to Federal agencies and questions relating to national security and foreign relations are resolved satisfactorily"—those questions I thought were on the way to being resolved satisfactorily, and I see no difference for the purpose of this letter, which was to get people to hand in their ideas and thoughts on whether to do them both, either one, or how the whole problem could be handled.

Mr. SCHEUER. It seems to me, without belaboring the point any further, that if it was appropriate language, it would not have been cut out; it would not have been changed. It does leave a paper trail that suggests that Comsat seemed to be your exclusive private sector advisor and that they had a remarkable access to the top thinking in the Department that no other private sector company seems to have.

Secretary BALDRIGE. Mr. Chairman, we had some 16 meetings with other firms than Comsat. Comsat has been in this business. They have lobbied hard. Unless you want to put a rule out that they cannot lobby, there is not much I can do about that.

As far as the question of a paper trail of this particular language, for the purpose it was used for I see nothing wrong with it.

Mr. SCHEUER. All right. I am not at this time suggesting any impropriety. I am expressing curiosity and concern.

On February 25, 1983—now we are moving ahead a few months—you sent out a letter to Mr. Craig Fuller, who is Assistant to the President for Cabinet Affairs, which suggested changes to the Presidential decision memorandum, the document on which the President would base his decision regarding commercialization. Now let's discuss that letter for a moment.

The first change which you suggested in the letter was that—well, let me read a sentence in the letter:

> Separate bids would be accepted for the land or weather satellites, any mix thereof, or any part of a single system, or a firm could elect to submit a single bid for all systems.

Now apparently you suggested that they drop the words "any mix thereof, or any part of a single system."

Secretary BALDRIGE. I sure did.

Mr. SCHEUER. Now tell us why you did that.

Secretary BALDRIGE. Very simple. That first statement that you had in there about any mix thereof——

Mr. SCHEUER. "Or any part of a single system."

Secretary BALDRIGE [continuing]. "Or any part of a single system" was put in there by the Cabinet Secretary, the fellow who was taking the notes at the meeting. It gave the wrong impression, as far as I was concerned. This, to me, was like correcting the notes of the meeting.

We did not want to leave any inference that a company could come up and bid on a third or a half or some parts of a system or we would have a real mess in trying to decide what to do about this kind of a transfer. These RFP's are complicated enough. We have broadened this choice deliberately to make sure no one company was favored by saying, yes, you can bid on Landsat or, yes, you can bid on Metsat or, yes, you can bid on both of them. However, to get into bidding on what could end up being tiny parts of that was just incorrect. That was not the sense of the meeting. This was like my correcting notes of a Cabinet secretary. I would make the same decision again. I think the language we have in there is correct.

Mr. SCHEUER. It seems to me that the provision "any mix thereof, or any part of a single system" is an appropriate policy, in that it enables private sector firms who have a particular specialization and particular creative ability in one given area to make a bid, to get into the act. Perhaps private firms that do not have the capital or even the expertise to take on the whole ball of wax—well, let's say the whole pie—they could come in for a slice of the pie. It might be that another private sector firm would come in for the rest of the pie.

Anyway, to me, keeping this—this language, "or any mix thereof, or any part of a single system," gave you extra options. It did not tell you what to do but it gave you the options of fitting in—I do not say what you might call mom-and-pop corporations, but certainly corporations that have less capital and perhaps less personnel, not in quality but in quantity, than Comsat. It would give you the options of creating consortia of firms—I'm talking about firms from the Silicon Valley on the West coast and the same kind of firms outside of Boston, Mass.

You could tap a whole reservoir of talent in middle-sized firms and create a consortium whereby they could operate one of these weather satellites with a number of firms participating, and perhaps you would have a whole which was greater than the sum of the parts. Perhaps it would have a higher level of sophistication than Comsat would have or any other great firm, AT&T, or whatever, would have.

Secretary BALDRIGE. Highly—excuse me.

Mr. SCHEUER. Yes. That is all right.

One wonders why you took out the provision that would provide a much broader scale of participation by middle-sized corporations?

Let me ask you this: Based on the September 1982 request for information, how many firms would bid on land or weather satellites?

Secretary BALDRIGE. I have not had a chance to answer your first question yet.

Mr. SCHEUER. Fine.

Secretary BALDRIGE. I would say, based on 25 years of being a chief executive officer of two different companies, I would say based on my business experience and on my public experience where I had to run the Resource Development Authority for the State of Connecticut and take these kinds of bids, that your theory, Mr. Chairman, while it is a lovely one, is highly unlikely to produce the required results. As a matter of fact, it is almost a recipe for putting too much on this horse's back.

You lose by doing what you are suggesting there. You lose the biggest thing that we need in something like this, and that is accountability. It is not enough to hand out the responsibility. On any kind of a deal like this you have to make somebody accountable. To allow people to bid on their favorite little part of it, so that you end up with 115 different subproposals to be fitted into a whole, is a management nightmare as far as any accountability goes. There is nobody to blame because everybody, if something goes wrong, can point to the other one. This is too important to leave to that kind of bidding. It is just not practical.

Mr. VOLKMER. Would the gentleman yield on that?

Mr. SCHEUER. Of course.

Mr. VOLKMER. Earlier, during my time, Mr. Secretary, I asked about the possibility that the RFP would allow consideration of an option in which the Government would provide all the information. You said that option would be included in the RFP.

Secretary BALDRIGE. No. I would not mind on the RFP if someone—some companies—decided that they would like that particular option. I think we ought to look at it. However, the reason that I do not want to include it as one of the standard possibilities is that again leaves the U.S. Government in the satellite business. We would be paying for the freight train, and they would be selling the goods. I think those two should be together.

I would not object if a company said: "Look, the only way we will even consider this is taking one broad part of it," like the part you mentioned, "but the Government will have to keep the satellites."

What the language that the chairman had in——

Mr. SCHEUER. It wasn't my language.

Secretary BALDRIGE. No, but that the secretary of our meeting had in—when he said, "any mix," that means that you could do what the chairman says, have somebody supply the semiconductors, somebody else supply some of the hardware, somebody else some more of the hardware. If something goes wrong, who is accountable?

I have been in that kind of a tight position too many times to get into that again. That is not the way to serve the taxpayers. You want somebody accountable for the whole thing.

If you took a major chunk such as you are talking about, that would still be a possibility, Mr. Congressman.

Mr. SCHEUER. May I say to the Secretary that I really think you have made this judgment prematurely. We have all kinds of experience with private sector groups taking a slice of the pie and having another private sector group responsible for the whole deal. That is the way any large building is constructed. You let out bids, or you have a general contractor who is in charge of the whole job. He lets

out bids. He has a dozen or more subcontractors who have responsibility for a specific slice of that pie, and the general contractor is under a contractual obligation to bring in the whole thing at the cost in the general contract and at the quality that is specified in the plans and specifications in the contract. That is a time-tested formula that has let many little, legitimate, mom-and-pop operations into the construction business.

I am not an expert in space and in NASA operations, but I would be astonished if there were not examples of a corporation that was given overall supervisory responsibility for a major operation and then they supervised several or perhaps many——

Secretary BALDRIGE. I agree, Mr. Chairman——

Mr. SCHEUER. Just let me finish.

Secretary BALDRIGE. Excuse me.

Mr. SCHEUER. Smaller corporations that took on a piece of the job.

The implications of your statement justifying excising this part of the words, "any mix thereof, or any part of a satellite system," mean that if you follow that logic, you are going to look for one single bid for all of the systems, either the Landsat satellite or the weather satellites. That is where the logic is going to take you.

I am suggesting that that is very anticompetitive. You are going to create a virtual monopoly situation where there is probably only one corporation in the United States that could take that on. If it is not a monopoly situation, it is certainly an oligopolistic situation, because there cannot be more than a very few others. You are going to exclude all of those brilliant, creative, utterly talented entrepreneurs in Silicon Valley and their counterparts in the East from any possibility of competing in this thing.

I do not think that it is the part of wisdom to give up your option, to include them if you decide a formula can be worked out that enhances the public interest, to give them a role. After all, you are going to make the decision. You are not going to be forced at gun point to take a dozen or a hundred of these middle-sized firms unless you think that accountability can be assured by having one managing entity for the whole operation with individual slices of that pie being passed out.

I do not think that that concept is very creative thinking on my part. It is time tested. One has to wonder why you are giving up the option of letting less than the gargantuan firms into the act?

Secretary BALDRIGE. I give two answers to that.

One is that the minutes have to reflect what went on at the meeting. "Any mix thereof" did not go on at the meeting. That is No. 1.

However, let's get back to the more important part, which is your statement about the Silicon Valley entrepreneurs who are brilliant people who would be kept out of that. I agree with you, they should have a chance to bid. That is not the point. The point is you do not mix up subcontracting and general contracting in the same bid. It is just not done.

You pick—this bid is to pick, in effect, what you would call a general contractor. There is nothing stopping company X, after we work this out with Congress and it were decided to go ahead, there is nothing stopping company X from then going out and doing the

subcontracting. However, you do not, in the examples you were using where general contractors were used, you do not get the subs bidding on the same level as the general contractor. That would just provoke untold confusion. We would be here for years trying to separate that out, if we had 150—I do not know how high it could go with that.

This proposal is supposed to get the general contractor in, if you want to use that example, and then he can subcontract out anything he wants to. However, he is accountable. That is the point I want to get over. He is accountable for putting up with all of these strictures that we are putting on national security, on foreign policy, on cost, and everything else. You have to have one person accountable.

How he, then, spreads out that accountability underneath him, I agree with you completely, but let's not mix them up at the beginning. It is not practical.

Mr. SCHEUER. Mr. Secretary, we have an honest difference of opinion here. I believe the thing ought to be opened up, and I believe the problems of accountability and control can be easily solved. However, we will have plenty of opportunity to discuss that when you come to us with your draft of an RFP. All right?

Secretary BALDRIGE. I was trying to explain why I made that change and answer your question.

Mr. SCHEUER. OK. I happen to think it is an unwise change, but this is not the forum to decide that.

I still have not finished my paper trail, but at this time I would like to yield to Mr. Volkmer.

Mr. VOLKMER. Yes. Thank you.

Mr. Secretary, I would like to ask a basic, followup question to some that I asked earlier. When the chairman of the full committee, Mr. Fuqua, started out, it was understood that the RFP's would be submitted to us to look at before they would go out to the private enterprise entrepreneuers on this.

How are we going to have input into those RFP's after they are submitted to us?

Let me make a suggestion. In the event that the appropriate committee or subcommittee of the House or the Senate would make recommendations of changes or inclusions of different methodology in making the RFP, that does not mean that you would have to follow it, does it?

Secretary BALDRIGE. No, it doesn't. Legally we do not have to do that. I think you would find me wanting to cooperate in that area, however, because there is no single source of all knowledge, and I want to cooperate to the fullest extent. That would mean whatever time you thought you needed to study these—you would not find me a problem on that.

Mr. VOLKMER. You would not be adverse to recommendations that were made perhaps by a consensus of a committee?

Secretary BALDRIGE. No, not at all. Not at all. In fact, I must say I might have to disagree with the chairman on all these bids, but maybe he has a way that that can be accomplished. I would have an open mind on that.

Mr. VOLKMER. Those are some of the reasons I am asking these questions, because as I look at it later on somewhere down the line

there is going to have to be legislation. I think we all agree on that. I would not want us to get off on the wrong foot, so that somewhere down the line the legislation may be thwarted just because maybe Congress felt it did not have the input that it should have had.

Secretary BALDRIGE. I agree completely.

Mr. VOLKMER. All right. Now to follow up on some of the questions from the gentleman from Pennsylvania, Mr. Walker, when the RFP's come back, when they are evaluated, will they be evaluated not only as to what it is costing us now, and, what it is projected to cost if we continue these services and what they will do and how much they will be paying us for the systems that the commercial sector would take over, but also as to any revenue loss. That does concern many members up here, that the revenue loss and the tax implications be taken into consideration also.

After the RFP's have gone out and you have proposals back, are they going to be evaluated by a board of some type?

Secretary BALDRIGE. An interagency group would do the administration evaluation, in which all the Cabinet departments and the intelligence departments that had any reason to be concerned—and there are quite a few of them—would be represented and would make recommendations.

Then I think, at least the way I would see this—we do not have any specific plans today and I would be glad to listen to any ideas—I could see having a series of briefings for the appropriate congressional committees at that time and getting a joint agreement one way or the other that this was the proper thing to do because of the particular proposal that seemed to be favored, whichever one or whichever group of them, if it turns out separately, or agreeing that none of them are good enough; that we ought to keep on doing what we have been doing before.

Mr. VOLKMER. In other words the proposals could perhaps be submitted to us in advance so that we could review them, also?

Secretary BALDRIGE. I do not know.

Mr. VOLKMER. Can we do that?

Secretary BALDRIGE. I am not sure that we legally can because of proprietary data.

Mr. VOLKMER. That is what I was wondering.

Secretary BALDRIGE. However, let me say that my general feeling, Mr. Volkmer, is that Congress is going to have to pass a law on this. Our job in the administration should not be to withhold information or try to speed up deliberations unduly. Our job should be to have this completely understood, the pros and cons, the pluses and minuses, all the way across the board, so that a decision, that I would hope would be a joint decision, could be reached.

Eventually, Congress is going to have to make the decision.

Mr. VOLKMER. Yes, and we are going to need some basis on which to make the decision one way or another down the line. I am sure that when that time comes, there will probably be considerable amount of lobbying. Therefore, some of us feel we are going to need a little more objective information, which would be in the proposals themselves. If we cannot have those, then what are we going to base a decision on? That concerns me.

The other thing I would like to get into is perhaps a little discussion of time frames, which we have not discussed today. What is the timeframe we are looking at for requests for proposals?

Secretary BALDRIGE. Dr. Calio tells me his estimate, and he is working with this group, would be somewhere around 4 to 5 months to actually get an RFP in shape to look at.

I would propose consulting the Congress on that as early as we possibly could, so that you could have the time you need, so that there would not be any question of setting these in concrete but they would be at least sketched out enough so that there would be something to talk about there.

Mr. VOLKMER. That is part of what I am looking at. It is part of the problem. It depends on what we do up here this session. However, some of us hope to be out of here this fall. The possibility of not having the RFP's up here prior to September could cause some difficulties.

Secretary BALDRIGE. Dr. Calio tells me that we would hope to have a draft available, not the finished thing, within 2 to 3 months.

Mr. VOLKMER. That would be fine.

Secretary BALDRIGE. And then we could work.

Mr. VOLKMER. Then we are looking, for any legislation, for sure we are looking to 1984? I think we can agree on that.

Now to get back to the question, because it continues to bother me a little bit, on the RFP's and what is to be included, whole systems or part systems. I think you understand my discussion on the partial system for Landsat.

Now, as I understand it, what is known as the "Grace Report," the private sector survey on cost control, as I read their report they seem to recommend that a viable option for commercialization is the value-added services.

Do you agree with that assessment, my assessment, of their report?

Secretary BALDRIGE. Yes. I think that is probably a correct assessment.

I would like to make one other statement, though. We have seen several reports. We have had several experts. We are going to see more before we get through this whole process because I think we ought probably to hire some outside help after responses to the the RFP are in to check up on what you think and what we think.

In any event——

Mr. SCHEUER. Would the witness yield?

Secretary BALDRIGE. Yes.

Mr. SCHEUER. This is the point that I was trying to make. Intrinsically, these functions are separable on logical grounds. For example, the marketing function is a wholly different kettle of fish than operation of the satellite and operation of the ground stations.

Now the President's Private Sector Survey on Cost Control, as Congressman Volkmer noted, said only the data marketing should be spun off to the private sector. They said that because the marketing function is a whole different congery of creative talent. That is, Madison Avenue versus Silicon Valley.

Yet, as I get it, your proposal would not permit the marketing function from being spun off to Madison Avenue while the operation of the satellite and the ground stations might be spun off in

What do you mean we are getting an objective evaluation? We are putting up $1 million. There is a whole bunch of us that think the answer is "none of the above" now, and you are asking us to spend $1 million to find out that we are wrong, because commonsense tells us that this doesn't make sense.

Mr. KAMMER. And yet, sir, over the past 5 years the issue has persisted across two administrations.

Mr. MACKAY. Well, I understand that. I understand that. It is kind of peculiar to me to hear the Reagan administration arguing that the Carter administration may be right. In fact, that tends to undercut your argument.

Thank you, Mr. Chairman.

Mr. VOLKMER. I just want to say, Mr. Kammer, that those are the type of sentiments I have been hearing from other members here, and maybe in order to save everyone a lot of time and money, maybe it would be worthwhile to start that, quote, framework legislation and just really see, even in general terms, some type of guidelines, get an idea how the committee feels, because there are some on this committee that are very strong for it, but on the other hand you will find just the opposite also.

So I want to thank you for spending your time here today and your lunch hour, and we will probably have some additional questions.

For the sake of time, we will conclude the hearing now, and I thank you very much and wish you well in your work, and we will reconvene on the 28th. The questions I will be submitting will be some from Mr. Scheuer and myself, since Mr. Scheuer wasn't able to be here now. The Minority will probably have some questions, also.

Thank you.

[Whereupon, at 1:10 p.m., the subcommittees were adjourned, to reconvene, subject to the call of the Chair.]

THE COMMERCIALIZATION OF METEOROLOGICAL AND LAND REMOTE-SENSING SATELLITES

TUESDAY, JUNE 28, 1983

HOUSE OF REPRESENTATIVES, COMMITTEE ON SCIENCE AND TECHNOLOGY, SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS, AND SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT,
Washington, D.C.

The subcommittees met, pursuant to call, at 9:40 a.m., in room 2325, Rayburn House Office Building, Hon. Harold L. Volkmer (chairman of the Subcommittee on Space Science and Applications) presiding.

Mr. VOLKMER. The Subcommittee on Space Science and Applications, and the Subcommittee on Natural Resources, Agriculture Research and Environment will continue our joint hearings on remote sensing commercialization. We have several witnesses this morning and I will be very brief.

We are very glad to have Senator Pressler, a former member of this committee, back to testify before us this morning. If we are going to have framework legislation, we may need his help on the other side.

Our outside witnesses this morning have all studied the remote-sensing issue in one way or another, and they should provide very useful information. In particular, I believe that several of them will emphasize market and financial aspects of the issue, which should be most informative.

I welcome all the witnesses, especially our former colleague, and look forward to their testimony.

Senator Pressler, would you please take a chair. Your statement will be made a part of the record and you may either read from the full statement or summarize, however you so desire.

[The prepared statements of Mr. Scheuer and Mr. Lujan follow:]

OPENING STATEMENT OF HON. JAMES H. SCHEUER

The Subcommittees will come to order.

Today's hearing is the second in a series of four on the proposed commercialization of weather and land remote-sensing satellites.

We will hear first today from Senate Larry Pressler (R-S.D.), who for several years has been a leading voice in the Senate on this issue.

Next, we will hear testimony from a panel of three experts.

Mr. Joe Greenberg of ECON, Inc. and Mr. J. Robert Porter of Earthsat, Corp. have recently completed studies on alternatives for commercializing land remote-sensing satellites, as mandated by Public Law 97-324.

Mr. William Spann of Metrics, Inc. will discuss potential markets for land remote-sensing, a topic on which he is one of the world's leading experts.

We intend today to continue our examination of a number of issues that were raised during last week's hearing.

First, is the Administration's approach of issuing an RFP (Request-for-proposals) a reasonable one, or should a statement of Congressional policy—so-called "framework" legislation—precede any issuance of an RFP?

Secondly, does commercialization of weather satellites make sense, or does it merely distract from the real issue of this debate—whether the U.S. government should act decisively to maintain its technological leadership in land remote-sensing?

Finally, if land remote-sensing is the crucial issue, what cost-effective options are available to us for preserving U.S. leadership?

PREPARED STATEMENT OF HON. MANUEL LUJAN, JR.

Thank you, Mr. Chairman.

Last week we heard some interesting testimony of this issue, and had an opportunity to begin discussing our concerns. Some of this discussion focussed on the financial aspect of operating the remote sensing system. As we all know, there are large sunk costs associated with the system as well as the ongoing operation and maintenance costs. These costs should not be considered in the debate. To argue that the government should recover the research and development costs inbedded in the existing system is equivalent to asking that the government recover the cost of research on cancer therapy from a cancer patient or to ask that the costs of developing solar photovoltaic energy be recovered when these systems are commercialized. If the government intends to be reimbursed for research and development costs when a technology is transferred to the private sector, then perhaps the government should not be in the research and development business. Hopefully today we can focus instead on the other financial aspects of remote sensing, and Landsat in particular, and not continue to be preoccupied with whether or not the commercialization of remote sensing is a "fire sale."

Mr. Chairman, I look forward to hearing from our witnesses today and discussing these issues with them.

Thank you.

STATEMENT OF HON. LARRY PRESSLER, A U.S. SENATOR FROM THE STATE OF SOUTH DAKOTA

Senator PRESSLER. Mr. Chairman, I shall summarize. I shall be very brief.

Mr. VOLKMER. All right.

Senator PRESSLER. First of all, I want to compliment this committee for holding this hearing. You are ahead of us in the Senate. We have got to get our act together over there.

I am here to commend you for what you are doing, and also to say that I am trying very hard to get our Committee on Commerce, of which I am a member, to move forward as quickly as you are.

First of all, as a former member of this committee, I am honored to have the opportunity to testify before it. I see some of the staff is still working here. Most of the members of the committee have turned over since I was on it, although there are still many who were here during my terms in the House.

Mr. Chairman and members of the committee, commercialization of our land and weather satellite systems has many far-reaching implications for our national policy on satellite utilization. I have been actively involved in this area in recent years and have seen numerous reports and studies relating to commercialization and have talked to many experts in the field.

They all seem to say the same thing: Commercialization at this time just does not make sense. Yet we seem to persist. I fail to see the logic in this approach.

If this were an isolated issue, it would still be annoying to have it drag on as it has, but it is not isolated, and it is more than simply annoying. It is jeopardizing our entire land satellite system by detracting from the real issues at hand.

They include not only the question of commercialization, but also Landsat continuity, foreign competition, technological advancement and budgetary considerations. While we are muddling around trying to decide whether or not we will agree to turn the system over to someone who does not want it anyway, the French are going ahead with their SPOT satellite, which enhances remote sensing capabilities and would complement our own Landsat systems in many ways.

The Japanese and West Germans are also working on this technology.

The United States has always been the undisputed leader in this area. Now, while we drift aimlessly about, we are in danger of losing that lead. Indeed, it has reached the point where we, as a nation, have declared that we will get out of the land satellite business altogether before the end of this decade.

This decision comes after years of research and development in this area. We pioneered and developed the technology and the market to its present stage. Now we are proposing to hand it over to foreign competitors and get out of the business altogether.

Instead of the head-in-the-sand approach we are currently taking regarding foreign competition, we should be utilizing it to its fullest potential and combine it with our own Landsat technology for the best of both worlds.

We can do this for a fraction of the cost of a new facility by retooling our existing Landsat receiving and processing station, the EROS Data Center, in my home State of South Dakota.

TRW recently completed a study which shows the relatively small cost of adding a receiving antenna and the necessary software to process the SPOT data. EROS is world renowned for its high-quality products and excellent staff. It is a great source of pride for me as a Senator to have this vitally important facility in my home State of South Dakota.

The whole point of this testimony, and my being here this morning, is simply to say this: Let's quit muddling around in the present state of aimlessness and indecision we are now experiencing. Let's have an up-or-down vote once and for all on the commercialization issue, as soon as possible, so we can get on with the real issues at hand.

As I see them, they are:

First, Landsat continuity. Will the United States have land-remote sensing capabilities beyond the eighties, or will we watch the rest of the world pull the rug out from under us?

Second, foreign competition. Will we capitalize on the advances of our neighbors, specifically the French technology in this area, by having our own U.S. receiving and processing center, or will be become totally dependent on a foreign supplier for sensitive military information?

Because the French will launch their SPOT satellite in 1985, there is a need to address this issue in a timely manner.

Third, technological advancement. We have always led the way in this technology. Are we prepared to sit back and watch the state of the art stagnate and even pass us by?

Fourth, budgetary considerations. How much are we willing to commit to stay abreast of this important field? For a small amount, we can obtain the SPOT data. The larger budgetary consideration will be in relation to the continuity of Landsat.

But we cannot address these issues clearly and decisively until we resolve the question of commercialization. We do not need another study or evaluation board. We already have more information than we can digest.

Let's make a decision and get on with the business of state. The framework legislation suggested by this committee would be an excellent opportunity to do just that. When I introduced my bill to require congressional approval of any commercialization proposal, it was my intent then to address the issue once and for all. That was a month before the President made his decision to explore further the commercialization prospects for our land and weather satellites. Here we are today, still muddling through all the studies and statements, calling for more studies to study those we made in the past.

I am prepared to address the commercialization issue now and move on to bigger, more pressing policy decisions. I think that the rest of Congress is prepared to do the same.

I am ready to work with you, Mr. Chairman, and other distinguished members of the committee, in ending this procrastination now.

Thank you again for allowing me the opportunity to testify here today and for your important work in this area. Thank you.

[The prepared statement of Senator Pressler follows:]

STATEMENT OF U.S. SENATOR LARRY PRESSLER

BEFORE THE

HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY

MR. CHAIRMAN AND MEMBERS OF THE COMMITTEE, FIRST I WANT TO THANK YOU FOR THE OPPORTUNITY TO TESTIFY ON THIS VITALLY IMPORTANT ISSUE. I WILL TRY TO KEEP MY REMARKS BRIEF. COMMERCIALIZATION OF OUR LAND AND WEATHER SATELLITE SYSTEMS HAS MANY FAR-REACHING IMPLICATIONS FOR OUR NATIONAL POLICY ON SATELLITE UTILIZATION. I HAVE BEEN ACTIVELY INVOLVED IN THIS AREA IN RECENT YEARS, AND HAVE SEEN NUMEROUS REPORTS AND STUDIES RELATING TO COMMERCIALIZATION, AND HAVE TALKED TO MANY EXPERTS IN THE FIELD.

THEY ALL SEEM TO SAY THE SAME THING. COMMERCIALIZATION AT THIS TIME JUST DOESN'T MAKE SENSE. YET WE SEEM TO PERSIST. I FAIL TO SEE THE LOGIC IN THIS APPROACH.

IF THIS WERE AN ISOLATED ISSUE, IT WOULD STILL BE ANNOYING TO HAVE IT DRAG ON AS IT HAS. BUT IT IS NOT ISOLATED AND IT IS MORE THAN SIMPLY ANNOYING. IT IS JEOPARDIZING OUR ENTIRE LAND SATELLITE SYSTEM BY DETRACTING FROM THE REAL ISSUES AT HAND. THEY INCLUDE NOT ONLY THE QUESTION OF COMMERCIALIZATION, BUT ALSO LANDSAT CONTINUITY, FOREIGN COMPETITION, TECHNOLOGICAL ADVANCEMENT, AND BUDGETARY CONSIDERATIONS.

WHILE WE ARE MUDDLING AROUND TRYING TO DECIDE WHETHER OR NOT WE WILL AGREE TO TURN THE SYSTEMS OVER TO SOMEONE WHO DOESN'T WANT THEM ANYWAY, THE FRENCH ARE GOING AHEAD WITH THEIR SPOT SATELLITE, WHICH ENHANCES REMOTE SENSING CAPABILITIES AND WOULD COMPLEMENT OUR

OWN LANDSAT SYSTEM IN MANY WAYS. THE JAPANESE AND WEST GERMANS ARE ALSO WORKING ON THIS TECHNOLOGY.

THE U.S. HAS ALWAYS BEEN THE UNDISPUTED LEADER IN THIS AREA. NOW, WHILE WE DRIFT AIMLESSLY ABOUT, WE ARE IN DANGER OF LOSING THAT LEAD. INDEED, IT HAS REACHED THE POINT WHERE WE, AS A NATION, HAVE DECLARED WE WILL [redacted] GET OUT OF THE LAND SATELLITE BUSINESS ALTOGETHER BEFORE THE END OF THIS DECADE.

THIS DECISION COMES AFTER YEARS OF RESEARCH AND DEVELOPMENT IN THIS AREA. WE PIONEERED AND DEVELOPED THE TECHNOLOGY AND THE MARKET TO ITS PRESENT STAGE. NOW WE ARE PROPOSING TO HAND IT OVER TO FOREIGN COMPETITORS, AND GET OUT OF THE BUSINESS ALTOGETHER. INSTEAD OF THE "HEAD-IN-THE-SAND" APPROACH WE ARE CURRENTLY TAKING REGARDING FOREIGN COMPETITION, WE SHOULD BE UTILIZING IT TO ITS FULLEST POTENTIAL, AND COMBINE IT WITH OUR OWN LANDSAT TECHNOLOGY FOR THE BEST OF BOTH WORLDS. WE CAN DO THIS FOR A FRACTION OF THE COST OF A NEW FACILITY BY "RETOOLING" OUR EXISTING LANDSAT RECEIVING AND PROCESSING STATION--THE EROS DATA CENTER, IN MY HOME STATE OF SOUTH DAKOTA. TRW RECENTLY COMPLETED A STUDY WHICH SHOWS THE RELATIVELY SMALL COST OF ADDING A RECEIVING ANTENNA AND THE NECESSARY SOFTWARE TO PROCESS THE SPOT DATA. EROS IS WORLD RENOWNED FOR ITS HIGH QUALITY PRODUCTS AND EXCELLENT STAFF. IT IS A GREAT SOURCE OF PRIDE FOR ME AS A SENATOR TO HAVE THIS VITALLY IMPORTANT FACILITY IN MY HOME STATE OF SOUTH DAKOTA. # THE WHOLE POINT OF THIS TESTIMONY AND MY BEING HERE THIS MORNING IS SIMPLY TO SAY THIS: LET'S QUIT MUDDLING AROUND IN THE PRESENT STATE OF AIMLESSNESS AND INDECISION WE ARE NOW EXPERIENCING. LET'S HAVE AN UP OR DOWN VOTE ONCE AND FOR ALL ON THE COMMERCIALIZATION ISSUE--AS SOON AS POSSIBLE--SO WE CAN

GET ON WITH THE REAL ISSUES AT HAND. AS I SEE THEM, THEY ARE:

1. LANDSAT CONTINUITY -- WILL THE U.S. HAVE LAND REMOTE SENSING CAPABILITIES BEYOND THE 1980'S OR WILL WE WATCH THE REST OF THE WORLD PULL THE RUG OUT FROM UNDER US?

2. FOREIGN COMPETITION -- WILL WE CAPITALIZE ON THE ADVANCES OF OUR FOREIGN NEIGHBORS--SPECIFICALLY THE FRENCH--TECHNOLOGY IN THIS AREA BY HAVING OUR OWN U.S. RECEIVING AND PROCESSING CENTER, OR WILL WE BECOME TOTALLY DEPENDENT ON A FOREIGN SUPPLIER FOR SENSITIVE MILITARY INFORMATION? BECAUSE THE FRENCH WILL LAUNCH THEIR SPOT SATELLITE IN 1985, THERE IS A NEED TO ADDRESS THIS ISSUE IN A TIMELY MANNER.

3. TECHNOLOGICAL ADVANCEMENT -- WE HAVE ALWAYS LED THE WAY IN THIS TECHNOLOGY. ARE WE PREPARED TO SIT BACK AND WATCH THE "STATE-OF-THE-ART" STAGNATE, OR EVEN PASS US BY?

4. BUDGETARY CONSIDERATIONS -- HOW MUCH ARE WE WILLING TO COMMIT TO STAY ABREAST OF THIS IMPORTANT FIELD? FOR A SMALL AMOUNT, WE CAN OBTAIN THE SPOT DATA. THE LARGER BUDGETARY CONSIDERATION WILL BE IN RELATION TO THE CONTINUITY OF LANDSAT.

BUT WE CANNOT CLEARLY AND DECISIVELY ADDRESS ANY OF THESE QUESTIONS UNTIL WE RESOLVE THIS QUESTION OF COMMERCIALIZATION. WE DO NOT NEED ANOTHER STUDY OR EVALUATION BOARD. WE ALREADY HAVE MORE INFORMATION THAN WE CAN DIGEST. LET'S MAKE A DECISION AND GET ON WITH [redacted] THE BUSINESS OF STATE.

THE FRAMEWORK LEGISLATION SUGGESTED BY THIS COMMITTEE WOULD BE AN EXCELLENT OPPORTUNITY TO DO JUST THAT. WHEN I INTRODUCED MY BILL TO REQUIRE CONGRESSIONAL APPROVAL OF ANY COMMERCIALIZATION PROPOSAL, IT WAS MY INTENT THEN TO ADDRESS THE ISSUE ONCE AND FOR ALL. THAT WAS A MONTH BEFORE THE PRESIDENT MADE HIS DECISION TO EXPLORE FURTHER THE COMMERCIALIZATION PROSPECTS FOR OUR LAND AND WEATHER SATELLITES. AND HERE WE ARE TODAY, STILL MUDDLING THROUGH ALL THE STUDIES AND STATEMENTS, CALLING FOR MORE STUDIES TO STUDY THOSE WE MADE IN THE PAST.

I AM PREPARED TO ADDRESS THE COMMERCIALIZATION ISSUE AND MOVE ON TO BIGGER, MORE PRESSING POLICY DECISIONS. I THINK THAT THE REST OF CONGRESS IS PREPARED TO DO THE SAME. I AM READY TO WORK WITH YOU, MR. CHAIRMAN, AND THE OTHER DISTINGUISHED MEMBERS OF THE COMMITTEE, IN ENDING THIS PROCRASTINATION NOW.

THANK YOU AGAIN FOR ALLOWING ME THE OPPORTUNITY TO TESTIFY HERE TODAY, AND FOR YOUR IMPORTANT WORK IN THIS AREA.

Mr. VOLKMER. Thank you, Senator. We will now have questions under the 5-minute rule.

The gentleman from California, do you have any questions of the Senator?

Mr. BROWN. I do not think I have any questions of the Senator. I do compliment him on his statement. I think he has very succinctly put the issues in perspective here. I appreciate that very much.

I do have a minor question about how we—you are suggesting utilizing the SPOT technology and the fact that we could receive the SPOT products, but I have not thought of that before. It is a new idea to me and I would like to explore the technological aspects of it a little bit.

I do not know whether I should ask you that question, but there is a major difference, for example, in the resolution of the two products. I am wondering how we could combine the two, or if it is necessary to combine the two, how we would work out little details like that.

If you have thought about it, I would appreciate any comment you might make.

Senator PRESSLER. All right. I am not able to answer it completely here, but I will submit a statement on that resolution. We did have a meeting with the SPOT people and also with some of our Commerce and Interior people. It is the feeling of the French, as I gathered it, and I cannot speak for them, that they are very much concerned about getting a U.S. Government receiver antenna but they do not know quite what the status of that will be in 5 years or 10 years, if we are planning to commercialize or not.

They also have alternatives on the polar orbit or the main orbit in Canada that they are considering and in Mexico, or in building a private receiving station somewhere in the Southwestern United States. Those are just some things off the top of their head.

But at EROS Data Center, we do have the capability to receive, process, and integrate both technologies to gain maximum benefit from the resolution differences, so I am told, but I could get a more technical brief statement sent over for the record. I think it is a very good question.

[The information follows:]

Senator PRESSLER. There is also the question that the French, of course, want to enter into an agreement, as I understand, they are going to launch in 1985, and they want to sell as many of their products as they can. Of course, the United States is the best market. So, on the other hand, they would like a U.S. antenna somewhere.

I would not be surprised if we would lose it to Canada or Mexico unless we move fairly quickly.

Mr. BROWN. Senator, let me just ask one further question. The thrust of your presentation is that we have to get on with the very real job of maintaining the best land observation satellite system in the world and exploiting the commercial opportunities from that and not letting it get out of hand.

Now, we are seeing foreign competition develop that really the fundamental problem here is that we have got military systems on both sides which are observing the Earth with far greater detail than the Landsat system and providing that to the military users

on both sides. The civilian community gets no benefit from that at all, and the civilian program, the Landsat gets starved because it really is not making any money and there is not much we can do about that for the next 10 years probably.

Let me ask you, since I know that you have been concerned with some issues aimed at relieving the tensions that exist between ourselves and the U.S.S.R., such as approving a couple of negotiated antinuclear treaties, what would you say to the idea of really putting a first-class satellite observation system in place, merging the military with the civilian system, and putting half a dozen satellites up that could provide almost daily coverage of every place on Earth and making it available on a much broader scale to a much wider range of users than is being done at the present time?

Senator PRESSLER. Well, off the top of my head, without knowing all of the security implications, it would sound like a logical extension. We have almost reached a point where much of the information is pretty universally available and although we are on the brink of the war in outer space, which is also the issue of who controls the satellites, I know that DOD now recommends that all satellites put up be hardened and be equipped with optical lens protection features. These features are to protect the satellite from debris or sabotage.

So we are in the "Star Wars" concept, or we are in this business of killer satellites and space shuttles. I suppose that sovereign nations would be afraid of losing their capability if they shared it, if they launched satellites together, or if they shared it all.

I would think there would be an area here for international cooperation. I think your point is a good one. The various countries of the world—or at least our country—should be able to capture the signals from virtually every satellite that is out there. Our opposition is probably doing the same thing.

Mr. BROWN. Our present system prevents the American people from seeing photographs of Russian installations, which the Russians already know about, and prevents the Russians from seeing photographs of—well, what we are doing is keeping from the American people information which the enemies already have.

This is happening on both sides. At the same time, we are proposing to spend $3 billion on a system to knock out these observation satellites.

The best defense against observation satellite is redundancy. If we had a dozen of them up, and could put additional ones up at the drop of a hat, we would not have to worry about antisatellite systems. It would be far cheaper to spend the several billion that we are planning for antisatellite systems to knock out these Earth observation satellites on building more Earth observation satellites. It is just a matter of common sense.

But that ranges a little broadly from the issue before us this morning, so I will not belabor it.

Senator PRESSLER. I think it is a point that we have to consider in the whole area of the amount of money that we are spending. Of course, they say that if a thermonuclear weapon was launched into outer space, into the orbit and set off, it would pretty much make inoperable everything up there which is another aspect to the thing.

But it is something that we would probably be much better off with international cooperation if we could feel secure. I think we could move in that direction, but I do not really foresee in the near future.

We seem to have difficulty on Earth getting workable agreements, so I do not know if we are going to be able to do it in outer space, but I hope so.

Mr. BROWN. Thank you, Mr. Pressler.

Mr. VOLKMER. I now recognize the gentleman from Virginia, Mr. Bateman.

Mr. BATEMAN. Thank you very much, Mr. Chairman.

I find myself in sufficient broad agreement with the Senator's statement, that is difficult to frame questions of the Senator. I commend him for the time and attention that he has given to this issue of commercialization. It certainly is one that ought to occupy our time on an expedited basis to wrestle it to the ground and have it behind us.

I do share the view that there are so many national security and international implications, as well as implications of the proper role of Government as we face the issue of commercialization as to Landsat and Metsat, that we ought to, on a broad base, make the determination as to whether or not commercialization is feasible and do it very rapidly.

For my part, I am deeply skeptical that you can logically commercialize the Landsat and the Metsat programs. In our discussions late last week about commercialization in a very generalized context, it occurred to me that maybe there are areas of activities in space which do lend themselves to commercial applications where the information, the data, the product, is something that the private sector wants and which they are historically accustomed to expect from Government as a governmental function, as contrasted with the Metsat program, the Landsat program, where the data being accumulated is primarily accumulated as a part of the governmental service or responsibility.

Do you think that there is any merit in trying to isolate the commercialization issue on the basis of activities which are traditionally or historically of value to the private sector on an economic commercial basis, as opposed to those which are affected by a public interest, a governmental responsibility?

Senator PRESSLER. Well, I certainly appreciate the thrust of your question. I think it is probably a healthy thing occasionally for the Government to review its assets and see what can be sold and what cannot be. The Government is not necessarily locked into owning everything forever or doing everything the same way forever. But it has occurred to me that this is a little far-fetched, selling some of the satellites or weather services. There might be markets for some of the information, but they are not very profitable markets, except in a few instances.

In this one area, I think the public service—the public is served by Government ownership. I do not think it would have happened in the public interest in this particular area. I wish it would. I wish it were possible, but I am afraid that many of the scientific and public service type things that we expect from these satellites would not occur.

Of course, most of the proposals to commercialize them attach a huge subsidy which would not save the taxpayers money anyway. So it is a very difficult area, but while we are in this talk of commercialization, for example, the French are totally confused about what our intentions are. They really do not know if we are serious about this or not. It sort of paralyzes us. It is kind of like having a lawsuit against a piece of land or having it attached for 5 or 10 years during a lawsuit; nothing can happen.

That is what I analogize this commercialization to be. I think we should bring it to a vote and I think this committee has done well—better than we have done in the Senate certainly. We have got to speed up over there. I hope I can get my own Commerce Committee to hold as many good hearings and act as responsibly as this committee is.

I hope we can get an up-or-down vote on it so we can clear up this issue and then go on to the real policy decisions that we have to make.

Mr. BATEMAN. Senator, thank you again for your statement. The only other area that I would focus on—and I think perhaps this morning is not the time to do it—your references to the French and the SPOT data and how we might capture in some way that data and participate in that program. I think we need more specifics there as to what they might be amenable to and whether or not there is a proper role that we can and should play in connection with that program.

Mr. Chairman, I would think it would be of great interest to the committee to determine, at least conceptually, what might be mutually advantageous, or whether or not there is anything that is mutually advantageous with our national interests and sound public policy.

Mr. VOLKMER. Thank you, Mr. Bateman.

Before recognizing the chairman of the other subcommittee, I would like to state for the record that the statement of the gentleman from New York, Mr. Scheuer should appear in the record immediately following my statement, and also the statement of the ranking minority member on our subcommittee, Mr. Lujan, should appear following Mr. Scheuer's statement.

So for the purposes of the record, we will have that.

Does the gentleman from New York have any questions?

Mr. SCHEUER. Thank you very much, Mr. Chairman. It is a great pleasure to have our former colleague in the House and our former colleague on the Science Committee back here. We welcome him for his enlightened views and his highly complimentary thoughts on the work of this committee, for which we thank him.

I have only one question, Senator, and that is, can you give your insights on how the Senate is likely to deal with this problem.

Senator PRESSLER. Well, I am asking Chairman Packwood and the subcommittee chairman, Slade Gorton to schedule hearings. I am going to talk to them again today. We follow in the same pattern that you have, that we hold hearings and we get out a resoluton so that we have a vote, up or down, on commercialization, as you have provided such excellent leadership in moving toward. It would be my hope that if we had a vote on it in Congress, that would end the discussion. If we do not have that, we are going to

have more RFP's and more studies and more churning around for 3 or 4 years. Meanwhile, the SPOT satellite goes up in 1985, and other things happen. Time marches on.

If you have suggestions for me to carry back to the Senate, I am going to talk to Chairman Packwood of our Commerce Committee, of which I am a member, and the subcommittee chairman. We are trying to get hearings soon. We have been bogged down with all sorts of other battles over there ranging from unisex insurance to about 25 other issues, but hopefully this will take on a higher priority soon.

But if you have any advice for me to take back, I will carry it back.

Mr. SCHEUER. Well, I would not presume to advise the other body. I think whatever advice we may have is very clear to read in our hearings and the actions that we have taken.

Senator PRESSLER. Yes.

Mr. SCHEUER. I must say that the three people who are involved on the Senate side as major players in this: Senator Packwood, Senator Gorton, and yourself, speak volumes about the strength and vitality of our two-party system. I cannot imagine three members of the Senate who bring more talent, more character, more high intelligence and a finer quality of leadership to this or any other subject.

Really, I believe that. I think that the quality of the Senate leadership has been outstanding and those two men that you just mentioned are exceptionally talented members of the Senate, exceptionally diligent, decent, with a sense of the integrity of that body and the integrity of the Congress, the integrity of the role of the Congress in this tripartite arrangement that we have had for 200 years under our Constitution. Your record, your outstanding record speaks for itself.

I think anybody listening to those three names and knowing of the activities and the quality of these three men has to take heart that our two-party system is functioning exceptionally well, even with divided responsibility between the two parties. That still is casting to the surface a remarkable level of talent and commitment and concern in both Houses.

Senator PRESSLER. Thank you.

Mr. SCHEUER. I congratulate you for your concern and your leadership and I hope that you will be able to get a piece of time. I think that Senators Gorton and Packwood are such extraordinarily able and dedicated Senators, I cannot conceive of any problem deterring them from doing absolutely the right thing here except time, except the problem of getting them involved, getting their attention.

Senator PRESSLER. I am going to try to do that today. I appreciate your comments. In spite of your compliments, we are behind you over in the Senate in the sense that you have gotten more done over here on this issue and brought it to light. You are further down the track so we will try to catch up.

I am going to talk to both of them today and we are going to try to get a hearing similar to this and get the resolution voted out of the Commerce Committee onto the Senate floor and we will be making every effort to carry that out.

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So far, all the action has been on the House side, I must concede.

Mr. SCHEUER. Well, we hope you will catch up. I am sure that the kind of quality that you have over there is quite capable of doing it if we can just get them to clear their platter a little bit so that they can think about this.

I want to apologize to any of my colleagues or anybody in the audience who is offended by this excess of nonpartisanship that I have expressed. [Laughter.]

Mr. VOLKMER. The Chair now recognizes the gentleman from New Mexico.

Mr. LUJAN. Thank you very much, Mr. Chairman.

Larry, welcome back to this side of the House. We wish you would come over more often; we miss you over here.

The whole process that we are going through is a study, whether we ought to commercialize any of it, all of it, or any part of it. I must tell you that we were over at Langley yesterday, at both the NASA and the NOAA facilities at Wallops, and we were very impressed with all of the—I am not sure that technically I understand all that they are doing, but the end product was just super.

It does bother me a little bit to say that we should not be looking at whether we should commercialize or not. I guess my basic feeling is that all of our research activities within the Government, except the weapons work, I suppose, should be leading to commercialization at some point or another.

Perhaps your point is that it is too early to even look at it. Maybe somewhere down the future, it might prove to be profitable, but not right now.

Senator PRESSLER. Things could change. There may prove to be a market for some of these things that we do not know about today. At the present time, it is my feeling tnat we are losing time, valuable time, in going through more studies. I think we have had enough. Although certainly things could change substantially. I see us sort of paralyzed over a period of 5 to 10 years here unless we do something, unless we take some action now.

We have had several studies under the current circumstances. Now, as I said earlier, I think that it is a healthy thing for every government to look at all of its assets and see what can be sold and what can be turned over the private enterprise.

What we do today might be different 20 years from now or 10 years from now. I think your point is well taken. We cannot be locked in forever, but based on the information we have today, and I think we have done plenty of studies of this under the current circumstances, I just do not think commercialization is a feasible alternative. That would be the approach I would take.

If we can kind of resolve that and move forward, I think it would be healthier.

Mr. LUJAN. That is my general impression now, that perhaps we might not be ready to do it. Certainly not as a whole system. There are, of course, all kinds of subparts to the system of what we might be able to do.

Is your point—and I gathered that yesterday when we were visiting at Langley in the Wallops Island—that there is a concern among those people who are in operations that we are out here

dangling somewhere while you guys are studying what we are going to do? That is the damage that you are talking——

Senator PRESSLER. I think so. For example, in my talks with foreigners on this subject—and they were not of any official capacity, just informal—their feeling was the same way. It was, well, if we do enter into an agreement with the United States, with a Government facility, do we know it will be there in 10 years, or do we know who will own it, or do we know who we are dealing with with this commercialization possibility before us?

If we could resolve that it would certainly give them reassurances. Of course, a lot of these foreign governments and corporations operate a little differently. Although they may appear to be private corporations, if you dig back, they are semipublic or controlled by their governments, and they are not used to dealing with that sort of uncertainty.

So, yes, I get that feeling. The workers and the people in the field sort of feel that they are dangling, so to speak, while this process is underway. Although, as you say, there may be a change that occurs. There may be something new discovered that would make it profitable enough or make new avenues to it or something about it might change dramatically.

Based on the present information that I have, I would conclude that we should make a clear decision not to commercialize in the near future.

Mr. LUJAN. I think as a practical matter, that is the case. At least from my perspective in how I have seen the system work, and to reassure those that feel that they are dangling out there that a sale cannot take place unless and until there is some congressional action, some legislation to allow it, either in whole or in part. As we both understand the process, that is a long time coming.

We are not looking at commercialization in the near future under the most hurry-up circumstances. You folks are, as you say, involved in so many other things. Even here, most of our legislation, as you know, is concentrated on money matters and all of these policy matters are really being moved to the back.

So the point that I was trying to make is to those that are concerned that they might be dangling out there, that it is a long time coming before we are looking at any legislation.

Senator PRESSLER. Good point.

Mr. LUJAN. Thank you, Mr. Chairman.

Mr. VOLKMER. Thank you.

Senator, I do have one question. If we do not commercialize the land sensing part, Landsat, do we not have to get cooking on getting another satellite ready?

Senator PRESSLER. Yes, indeed!

Mr. VOLKMER. Because otherwise, we are going to have a hiatus or go out of it altogether.

Senator PRESSLER. As I understand it, our current equipment up there is getting sick, so to speak. We seem to be conceding this to other countries or other corporations. I think that we have a national interest and a commercial interest and all kinds of interests in being up to date.

Mr. VOLKMER. The other thing I would like to know is whether or not you have given any thought to the possibility of first com-

mercializing everything after, let's say, the raw data base on the Landsat and selling it off to whoever wants to buy it and let them do the value-added services, and so forth?

Senator PRESSLER. That might be an approach if there is enough of a market. I do not know if there is enough of a profitable market out there for it. Of course, you always can say, should we producing it if there is not. That would be a possible compromise, I suppose, but I just do not know. Having looked at some of the EROS data pictures and so forth, what they sell for and the profit margins, I am not too hopeful that there is enough of a market, but maybe there will be.

Mr. VOLKMER. I have no further questions.

Does the gentleman from Iowa have any questions?

Mr. HARKIN. No, Mr. Chairman.

Mr. LUJAN. Mr. Chairman, before we move on, I think you made a point that one of the things that we have to look at is selling portions of it. That might be one portion, selling the data. Of course, naturally some would want not to sell the data retrieval system that is in place, but that is another breakthrough, the owning of the satellites, the launching of them.

It could, for expertise, exist in the private system. We could look at portions of it being sold off.

Senator PRESSLER. That might well be a good idea. I want to reiterate my desire to work on legislation with you and with our committee. That could be a portion of it. But I do think we should make it clear that the basic concept of complete commercialization we should try to get an up-or-down vote not to go that route, but it may well be that there is a portion of it that could profitably be held out in the value-added area. Of course, one always gets into a question of semantics when dealing with terms like "value added."

Mr. VOLKMER. Thank you very much, Senator, for being here this morning.

Senator PRESSLER. Thank you very much.

Mr. VOLKMER. Our next witnesses will proceed as a panel. Mr. Joel S. Greenberg, vice president of Econ, Inc.; Mr. J. Robert Porter, president of Earth Satellite Corp.; and Mr. G. William Spann, president of Metrics, Inc.

Please come to the table and you may proceed in the order in which your name was given.

Mr. SCHEUER. Mr. Chairman.

Mr. VOLKMER. Yes.

Mr. SCHEUER. May I just say briefly for the record that the National Academy of Public Administration, which is one of the three organizations that was congressionally mandated to give us a report, was invited to participate in this hearing this morning. We had conversations with Mr. J. W. Walter, but for reasons good and sufficient for them, they declined to appear. We regret that.

Mr. VOLKMER. Yes.

All right, Mr. Greenberg, you may read your full statement or you may summarize your statement. It will be made a part of the record, just like the other witnesses' statements will also be part of the record, the full statements.

STATEMENTS OF JOEL S. GREENBERG, VICE PRESIDENT, ECON, INC.; J. ROBERT PORTER, PRESIDENT, EARTH SATELLITE CORP., ACCOMPANIED BY CHARLES SHEFFIELD; AND G. WILLIAM SPANN, PRESIDENT, METRICS, INC.

Mr. GREENBERG. Thank you, Mr. Chairman.

I will summarize the statement that I submitted. Since the early 1970's, ECON, and I as an individual, have been involved in numerous studies of the land remote sensing and meteorological satellite programs.

Most recently, I was responsible for a study pertaining to commercialization of the civil land remote sensing system conducted for the Department of Commerce. My remarks will be limited to the civil land remote sensing system.

Our study investigated financial and nonfinancial issues associated with various commercialization and retention options. We attempted to play the role of a pragmatic entrepreneur. We formulated business plans based upon a limited number of scenarios, but did not consider the value-added businesses.

These plans were developed for financially viable business ventures and considered the technology, schedules, user requirements and market forecasts, costs and capital requirements. The bottom line was the Government cost, which is the net of cash inflows, such as lease and asset recoupment payments, the TDRS use payments, profitsharing, royalty or dividend payments, and generated tax revenue and various outflows, such as cost of Government purchase of information products, operating costs, subsidy payments, R&D costs, interest on debt, and equity purchases.

There are many possible business systems that may be considered as commercialization of the civil land remote sensing program. We found that to understand the financial implications of commercializations, it is absolutely necessary to consider specific business ventures.

A specific business system was developed for providing uninterrupted service resulting from the continued use of Landsat D and D' and phasing in, as necessary, new satellites.

The following options were evaluated: The continued ownership and operation by the Federal Government with currently planned phaseout; continued ownership and operation by the Federal Government with the reestablishment of the necessary budget line items; a wholly privately owned and operated entity competitively selected; a phased private ownership situation where the Government would own and operate the space and the ground segment, with the private sector doing the marketing and the sales; and finally, a legislatively chartered, but privately owned corporation with the Government having an equity position.

Government net cashflows, or costs, were developed in all cases. For the private-sector scenarios, financially viable business ventures were developed based upon achieving return on capital and other financial measures deemed necessary to achieve financing. The required rates of return were obtained through the use of Government subsidies.

The phased private-ownership scenario requires some explanation. In this scenario, the Government owns and operates the space

and ground segments and franchises a private-sector organization to market and sell the information products. In return for such rights, the private sector would pay a royalty fee with a minimum annual guarantee back to the Government.

Underlying all of the commercialization scenarios is a market or demand forecast that is characterized by great uncertainty. It is the lack of understanding of the market that is the underlying cause of the lack of private-sector interest in commercialization at the present time.

A basic decision that has to be made is whether or not the Government will continue to participate through ownership and operation and/or subsidization or will withdraw from the remote sensing scene.

Withdrawal implies a continuing cost, either through the acquisition of information products, or through benefits that are foregone. The average cost we estimated for this situation would be about between $10 and $15 million a year.

Based upon the specific business venture analyzed, Government costs associated with continuation of land remote sensing are anticipated to vary only slightly with the commercialization or retention scenarios. It is anticipated that Government annual cost will average on the order of $70 to $80 million through and possibly beyond 1994.

Keeping in mind the limited scope of the recent commercialization study, based upon the financial results, it appears that full transfer of the civil land remote sensing system to the private sector, with the expectation of a viable self-sustaining enterprise, is premature.

Continuity of service is important. Procurement of another Landsat-type satellite beyond D′ would reduce the likelihood of a discontinuity in service, extend the window available for making the critical commercialization decisions, and allow more time for assuring that correct decisions are made.

Prior to the issuance of an RFP, additional analyses should be undertaken of the mechanisms of carrying out the transfer of remote sensing systems to the private sector. Specifically, an indepth quantitative market analysis should be undertaken. Let us not have surveys, but an indepth quantitative analysis.

Analyses and evaluations should continue of other scenarios for commercialization of civil land remote sensing systems, the meteorological remote sensing systems, and the combined land and meteorological systems.

In anticipation of the need to competitively select a commercialization alternative, it is necessary to develop evaluation criteria and value functions against which commercialization proposals may be evaluated and then compared on a common basis. The selection of criteria can have a significant effect on which alternative is selected. Such criteria as minimization of Government subsidies and maximization of societal benefits should be considered. These could lead to selection of significantly different alternatives.

It is likely that there is room for only one system for each major product class, and the selection of the wrong system may eliminate the possibility for a decade or more of achieving the right system.

An understanding of the impact of near-term decisions on long-term options should be developed.

It will be necessary to perform indepth analyses of each proposal received as a result of the RFP to establish estimates of the likelihood of success, both technical and economic, of the proposed ventures, since failure will, at a minimum, necessitate a Government bailout, a discontinuity in service, or, in the worst case, the total elimination of the service.

I wish to thank you for the opportunity to present the results of our recent work and I will try to answer your questions. Thank you.

[The prepared statement of Mr. Greenberg follows:]

ECON INCORPORATED

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June 28, 1983

STATEMENT OF
MR. JOEL S. GREENBERG
VICE PRESIDENT
before the
SUBCOMMITTEES ON NATURAL RESOURCES, AGRICULTURE RESEARCH
and
ENVIRONMENT AND SPACE SCIENCE AND APPLICATION
of the
COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

Mr. Chairman, Members of the House Committee on Science and Technology, I appreciate the opportunity to meet with you today. Since the early 1970s, ECON, and I as an individual, have been involved in numerous studies of the land remote sensing and meteorological satellite programs. During the past two decades I have been involved in the planning and evaluation of numerous commercial business ventures. Most recently I was responsible for a study pertaining to commercialization of the civil land remote sensing system conducted for the Department of Commerce. This resulted in a report entitled "Commercialization of the Land Remote Sensing System: An Examination of Mechanisms and Issues" which I would like to become part of the record. My remarks today will be based primarily upon the results of this study. They will be, as was the referenced study, limited to the civil land remote sensing system. Also, due to the limited scope of this study many important issues were not addressed and therefore will not be discussed.

Our study investigated financial and nonfinancial (i.e., political, institutional, legal/regulatory, international, national security and policy) issues associated with various commercialization and retention options. We attempted, in a very short time, to play the role of a pragmatic entrepreneur who senses that there is a technology base that has been developed that if used properly may profitably satisfy market demand. We therefore formulated business plans based upon a limited number of scenarios. Due to the short duration of the study there was no time to refine or optimize these plans, nor was it possible to consider value added

businesses. These plans, developed for financially viable business ventures with financial viability based upon financial performance measures as required by the capital markets community to provide the necessary capital, considered the technology, schedules, user requirements and market forecasts, costs and capital requirements. Basically, return on capital and other objectives were specified and the revenue required to yield the objectives was established. The difference between the revenue required to justify the investment of private funds and forecasted revenue from sales was then the necessary revenue subsidy. The revenue subsidy should not be mistaken for the government cost associated with the land remote sensing system. It is but one component which can be traded off against others. The bottom line is the government cost which is the net of inflows (such as lease and asset recoupment payments, TDRS use payments, profit sharing, royalty or dividend payments, and generated tax revenue) and outflows (such as cost of government purchase of information products, operating costs, subsidy payments, R&D cost, interest on debt and equity purchases). We thus established the government cost associated with each of the business plans.

Benefit and cost effectiveness studies performed over the past decade have concluded that the potential benefits from a LANDSAT system would be in the range of hundreds of millions to a billion dollars annually. With these large potential benefits an obvious question is why has commercialization not taken place? A likely answer to this question is that a public sector undertaking, such as the LANDSAT program, can be justified by the government if it can be shown that the potential benefits from the program exceed program costs. The benefits accrue to the public at large and it should be the public sector's objective to maximize these benefits. A private sector business venture may provide the same public benefits but the benefits of primary concern to the venture are profits. The private sector objective is profit maximization.

It is very often the case that the objectives of profit maximization and benefit maximization do not coincide. This is normally the case when there is a lack of pricing mechanism that directly relates to benefits. To illustrate, consider a system that improves emergency communications in rural areas. Studies have shown that this could lead to thousands of lives saved annually having economic value to society of hundreds of millions to billions of dollars. However, commercialization is not likely to occur specifically for this application because there does not appear to be a pricing mechanism that can be related to the value of lives saved.

Unfortunately, many of the potential benefits from land remote sensing have not been linked by a pricing mechanism; in other words they are a public good. To date it appears that pricing mechanisms have primarily been established based upon budgets that have been developed over time for providing information products that are inferior to those that could result from using LANDSAT data. Generally, budgets have not been increased because of the "added capability" or added value of the LANDSAT information products to society. Thus the markets to date for LANDSAT type products have been largely related to historical data collection budgets. New or increased markets will only develop as an appreciation develops for the added capability and added value of the LANDSAT type products. When budgets are not increased to the point where net benefits are maximized through private sector actions, government participation through ownership and operation or subsidization may be appropriate in order to achieve the societal benefits that might otherwise be foregone.

There are many possible business systems that may be considered as commercialization of the civil land remote sensing program. These range from short duration flights of instruments carried in the Space Shuttle with marketing and sale of collected data, to a combined land and weather remote sensing operational system with marketing and sale of information and value added products. In order to understand the financial implications of commercialization it is necessary to consider specific business ventures. Therefore, a specific business system was developed for providing uninterrupted service resulting from the continued use of LANDSAT D and D' phasing in, slightly before the demise of D', new satellites with 80m and later 30m sensors having stereoscopic capability. The following commercialization or retention options were evaluated and compared under the above business system:

- Continued ownership and operation by the federal government (planned phase-out)
- Continued ownership and operation by the federal government (establishment of the necessary budgetary line items)
- Wholly privately-owned and operated by an entity competitively selected
- Phased private ownership (government ownership and operation with private sector marketing)
- Legislatively-chartered, privately-owned corporation (government equity position).

The analysis of these scenarios was developed based upon the same demand forecast and the same schedule of events. Government net cash flows (costs) were developed in all cases. For the private sector scenarios, financially viable business ventures were developed based upon achieving return on capital and other financial measures deemed necessary to achieve financing. The required rates of return were obtained through the use of government subsidies.

The phased private ownership scenario requires some explanation. In this scenario the government owns and operates the space and ground segments and franchises a private sector organization to market and sell the information products. In return for such rights the private sector would pay a royalty fee of 80 percent of revenue with a minimum annual guarantee of $33 million.

Underlying all of the commercial or retention scenarios is a market or demand forecast that is characterized by great uncertainty. Because of the limited scope of our study an indepth market study was not possible—instead we relied upon "informed judgments."

A basic decision that has to be made is whether or not the government will continue to participate through ownership and operation and/or subsidization or will withdraw from the remote sensing scene. Withdrawal implies a continuing cost either through the acquisition of information products or through benefits foregone. Withdrawal decreases the likelihood of commercialization which in turn is likely to result in price increases from SPOT or other systems through reduced competition. Government withdrawal (Phase-out) can be the lowest cost alternative <u>if</u> potential benefits are not significantly larger than costs and the cost of information products does not rise significantly. Average annual cost is estimated as $15 million (FY '83 $).

Based upon the specific business venture analyzed, government costs associated with continuation of land remote sensing are anticipated to vary only slightly with the commercialization or retention scenarios. It is anticipated that government annual costs will average on the order of $70 to $80 million (FY '83 $) through, and possibly beyond, 1994. The effect of asset transfer and recoupment policy appears to be minimal because of the subsidized nature of the business ventures. The effect of return on equity and cost of borrowing is somewhat more significant though not a major factor. Reducing required return on equity and the cost of borrowing from 17 and 11 percent to 14 and 9 percent, respectively reduces average annual government cost from $82 to $75 million.

Keeping in mind the limited scope of the recent commercialization study, based upon the financial results, it is possible to make a plausible case that full transfer of the civil land remote sensing system to the private sector with the expectation of a viable, self-sustaining enterprise is premature. Thus, if it is desired to continue land remote sensing then it is possible to argue that either

- There is a justification for government support for transfer recognizing the high value of land remote sensing information products, the possible lack of pricing mechanisms that reflect this value and the resulting high risk character of transfer to the private sector, or
- There is a need for continuing government leadership in this area with a limited but possibly gradually increasing private sector role.

The following recommendations are offered based upon the premise that commercialization issues will persist.

Because of the importance of decisions relating to commercialization, and the compressed timeframe for making these decisions which have long-term implications, it is recommended that a number of actions be immediately initiated so that informed decisions can be made. It should be noted that initiation (by the government) of procurement of another LANDSAT type satellite (beyond D') would extend the window available for making the critical commercialization decisions and allow more time for insuring that correct decisions are made.

It is recommended that analyses of the mechanisms of carrying out the transfer of remote sensing systems to the private sector continue. Specifically it is recommended that:

- An in-depth quantitative market analysis be undertaken that will lead to definitive market forecasts based upon an understanding of demand relative to information product price, resolution, number and location of spectral bands and other important product attributes. Let us not have surveys but in-depth quantitative analysis!
- Analyses and evaluations continue of other scenarios for commercialization of the civil land remote sensing system, the meteorological remote sensing system, and combined land and meteorological systems.

It is also recommended that, in anticipation of the need to competitively select a commercialization alternative, evaluation criteria and value functions be developed against which commercialization proposals may be evaluated and then compared on a common basis. The selection of criteria can have a significant effect on which alternative is selected. Such criteria as minimization of government subsidies and maximization of societal benefits should be considered—these could lead to the selection of significantly different alternatives.

Since it is likely that there is room for only one system for each major product class, and the selection of the "wrong" system may eliminate the possibility for a decade or more of achieving the "right" system, it is also recommended that analyses be performed of the impact of near term decisions on long-term options.

Finally, since the analysis and evaluation of proposals for commercialization may lead to the selection of a desired alternative, it is recommended that in-depth analyses be performed of each proposed alternative to establish estimates of the likelihood of success (both technical and economic) since failure will at a minimum necessitate a government bail out, a discontinuity in service or, in the worst case, the total elimination of the service.

I wish to thank you for this opportunity to present the results of our recent study and I will try to answer your questions. Thank you.

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COMMERCIALIZATION OF THE LAND REMOTE SENSING SYSTEM: AN EXAMINATION OF MECHANISMS & ISSUES

Prepared for

U.S. Department of Commerce

Under Contract No.
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Prepared by

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ABSTRACT

In September 1982 the Secretary of Commerce was authorized (by Title II of H.R. 5890 of the 97th Congress) to plan and provide for the management and operation of the civil land remote sensing satellite system, to provide for user fees, and to plan for the transfer of the ownership and operation of future civil operational land remote sensing satellite systems to the private sector. As part of the planning for transfer, a number of approaches were to be compared including wholly private ownership and operation of the system by an entity competitively selected, mixed government/private ownership and operation, and a legislatively-chartered privately-owned corporation.

This report presents the results of an analysis and comparison of a limited number of financial and organizational approaches for either transfer of the ownership and operation of the civil operational land remote sensing program to the private sector or government retention. The following basic approaches were considered.

- Continued ownership and operation by the federal government (planned phase-out)
- Continued ownership and operation by the federal government (establishment of necessary budget line items to continue provision of the data services)
- Wholly private ownership and operation of an entity competitively selected
- Phased private ownership (government ownership and operation with private sector marketing)
- Legislatively-chartered, privately-owned corporation.

Each of these scenarios was developed based upon the same demand forecasts and the same schedule of events. Government net cash flows were developed in all cases. For the private sector scenarios, financially viable business ventures were developed based upon achieving return on capital and other financial measures deemed necessary to achieve financing. The required rates of return were obtained through the use of government subsidies. For each scenario a complete set of financial plans was developed. Nonfinancial issues were identified in general and specifically related to each scenario.

ACKNOWLEDGEMENTS

The principal contributors to this study and authors of this report were Mr. J. Kevin Cauley, Ms. Carole Gaelick, Mr. Joel S. Greenberg, Dr. John Logsdon and Ms. Tracie Monk. They were assisted by Mr. B.P. Miller and a group of capital market consultants including Mr. Madison Haythe, William Sword & Co., Dr. Adrian Stear, Consultant, and Mr. Jerome Simonoff, Citicorp. The study was managed by Mr. Joel S. Greenberg.

During the course of this study many individuals and organizations were contacted, and provided valuable assistance without which this study could not have been accomplished. Among these were the National Oceanographic & Atmospheric Administration (NOAA); National Environmental Satellite, Data and Information Service (NESDIS); National Aeronautics & Space Administration (NASA), both Headquarters and Goddard Space Flight Center; U.S. Department of Agriculture (USDA), both the Foreign Agriculture Service and the Statistical Reporting Service; the Central Intelligence Agency; the Department of Interior (DOI), including the Bureau of Land Management, the U.S. Geological Survey and the Earth Resources Observation System Data Center; U.S. Foreign Service; Congressional Research Service; Communications Satellite Corp.; Spot Image; RCA; General Electric; American Science and Technology Corp.; GeoSat; Metrics; Lockheed; Hughes and Terra-Mar.

This study was performed under the direction of Mr. W. Eskite, NOAA.

Joel S. Greenberg
Vice President

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1. INTRODUCTION

For more than a decade, and at a cost estimated to be in excess of $1.5 billion, the U.S. government has conducted research, development and demonstration of land remote sensing technology. These programs have now progressed to the point where data is being obtained on a continuous basis from a land observation satellite (LANDSAT D) and information products are provided to and utilized by government, industry and foreign organizations. During the past few years attention has increasingly focused on the operational nature of the LANDSAT system which includes a space data collection segment and a ground processing and information dissemination segment. The federal government, realizing the operational nature of the system designated, in November 1979 the National Oceanographic and Atmospheric Administration (NOAA) to manage the LANDSAT system. NOAA was selected as the operating agency because of its experience in managing and operating the National Environmental Satellite System which has involved 24 environmental satellites since 1966 [1].

As the land observation satellite system continued to evolve, attention has focused on the appropriate public sector and private sector roles [2-20]. In keeping with this, in September 1982 the Secretary of Commerce was authorized to plan and provide for the management and operation of the civil land remote sensing satellite system, including the LANDSAT D and D' satellites and associated ground system equipment transferred from NASA; to provide for user fees; and to plan for the transfer of the ownership and operation of future civil operational land remote sensing satellite systems by the private sector, when in the national interest [10]. As part of this planning for the transfer of the ownership and operation of civil operational land remote sensing satellite systems to the private sector, the Secretary was requested to:

A. Conduct a study to define the needs of the government for land remote sensing data

B. Determine and describe the equipment, software and data inventory susceptible to transfer to the private sector

C. Compare various feasible financial and organizational approaches for such a transition.

Criteria for the comparison was to include considerations such as: maintenance of data continuity; maintenance of U.S. leadership; national security; international

obligations; potential for market growth; cost to the government; independence of subsidy or financial guarantee from the government; potential of financial return to the government and price of data to users. The following approaches were to be compared: 1) Wholly private ownership and operation of the system by an entity competitively selected; 2) mixed government/private ownership and operation; and 3) a legislatively-chartered, privately-owned corporation.

In addition to the above studies and comparisons, the Secretary was asked to fund at least two parallel studies outside the government so as to independently conduct the comparisons called for above. ECON, Inc. was selected early in January 1983 as one of the contractors to perform these studies. The results of this work are reported herein.

The specific objective of the study was to provide an analysis and comparison of a limited number of financial and organizational approaches for either transfer of the ownership and operation of the civil operational land remote sensing program to the private sector or government retention. The following basic approaches for commercialization or retention were considered:

- Continued ownership and operation by the federal government (planned phase-out)
- Continued ownership and operation by the federal government (establishment of necessary budget line items to continue provision of the data services)
- Wholly private ownership and operation of an entity competitively selected
- Phased private ownership (government ownership and operation with private sector marketing)
- Legislatively-chartered, privately-owned corporation.

We have taken the position that in order to evaluate the alternatives it is necessary to plan potential business ventures and evaluate their financial merit, the likelihood of their financing and their impact on government cash flows. We have tried to play the role of an entrepreneur, putting together business plans for the purpose of obtaining financing. The business plans are based upon a perceived technology base and a market forecast. The market forecasts are felt to be reasonably conservative because of the selected role (as entrepreneur). It is obvious that many business scenarios may be developed, ranging from flying an instrument in the Space Shuttle and selling resulting images, to the Communications Satellite Corporation's proposal to acquire and operate a combined land observation and meteorological satellite system. Due to the very finite nature of

this study, a specific business system was defined (Section 3) and used as the common basis for analyzing the various approaches for commercialization or retention of the land remote sensing system. It must be emphasized that this system has not been optimized either from the point of view of private sector profit maximization or public sector benefit maximization. It appears to be a reasonable possibility with its main virtue being the introduction of commonality which facilitates comparison between all of the approaches analyzed.

It should be noted that the selected business system does not include "value added" functions. It was not possible within the scope of the current effort to obtain sufficient information to allow the planning of value added business ventures.

Figure 1.1 presents an overview of the study approach. The first step was the development of the financial and organizational options of interest. In order to compare these options or scenarios, a common business scenario was defined. This included a schedule of events, data flows and other important features. This is described in Section 3, The Business Scenario. Section 2 presents, as general background, a description of the current land observation system upon which the business system builds. A demand forecast was made based upon a review of the published literature and discussions with current and potential user groups and competitive suppliers of information products. The demand forecasts and projected revenues are described in Section 4, The Marketplace. These forecasts and projections were held constant across all scenarios. Cost estimates were based upon detailed data obtained from the current operating entities and are described, as appropriate, in Section 6.1 through 6.4. Detailed schedules in support of the specific cost items are presented in appendices.

The demand forecasts and the cost estimates together with other information such as recoupment, leasing and subsidy policies and desired return on capital served as input to the financial analyses. The financial analyses developed the pro forma income statements, cash flow statements and balance sheets for a ten-year planning period. The financial analyses were performed for each of the scenarios of interest. The specific scenarios are described in Section 5 and the financial analyses are described in Section 6. The financial analyses were used as input to a government cash flow analysis—this is also discussed in Section 6.

The results of the financial analyses were reviewed by a group of individuals with expertise in the capital markets. The review established financial criteria

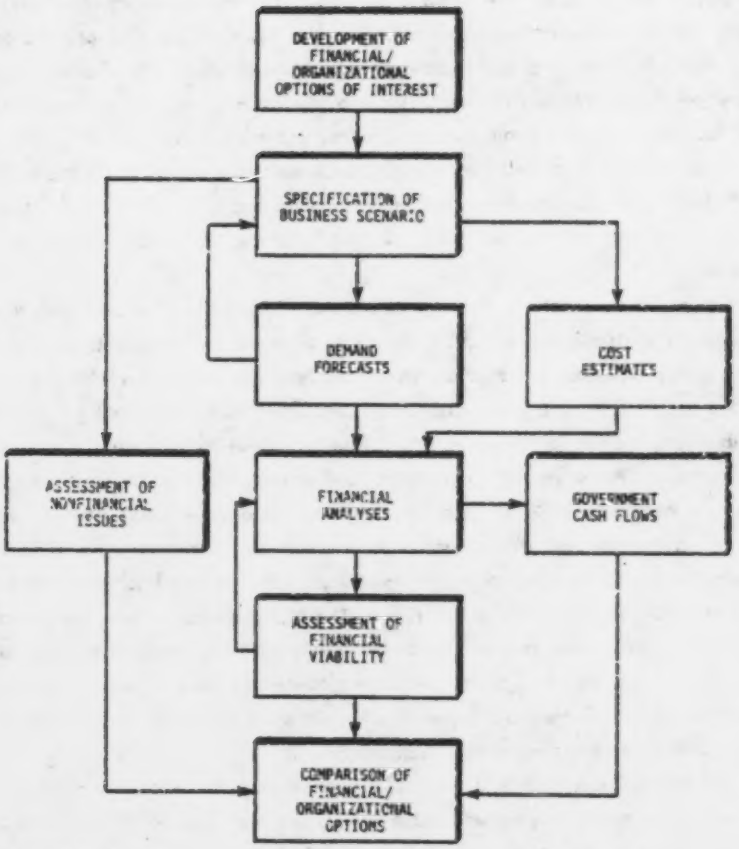

FIGURE 1.1 OVERVIEW OF STUDY APPROACH

that must be met in order to have a viable business venture—i.e., attract investment funds from capital markets. These criteria are described in Section 6 as well as the general procedure used in the financial analyses.

In parallel with, and at times providing guidance to the financial analyses, an assessment of nonfinancial issues was performed. These included political, institutional, legal/regulatory, international, national security and policy issues. These are discussed in Section 7 with emphasis placed on differences in their effects upon the different scenarios. The objective of considering these issues was to establish policy, legislative and organizational requirements that are deemed necessary for each of the scenarios to be viable.

General and specific observations and conclusions are presented in Section 8 and recommendations are presented in Section 9.

The data utilized in this study was obtained from the indicated referenced documents and from discussions with individuals in government agencies and commercial organizations. These included the National Oceanographic & Atmospheric Administration; National Aeronautics & Space Administration; U.S. Department of Agriculture, both the Foreign Agriculture Service and the Statistical Reporting Service; the Central Intelligence Agency; the Department of Interior, including the Bureau of Land Management, the U.S. Geological Survey and the Earth Resources Observation System Data Center; U.S. Foreign Service; Communications Satellite Corp.; Spot Image; RCA; General Electric; American Science and Technology Corp.; GeoSat; Metrics; Lockheed; Hughes and Terra-Mar. Due to time constraints this data could not be independently validated or estimated. The fact that this data is used in the study reported herein should not be interpreted to mean that these estimates are considered to be valid.

2. THE CURRENT LAND OBSERVATION SYSTEM

Remote sensing implies the detection of the nature or condition of an object without touching it. The advent of first the photographic camera and later the airplane represented major advances in remote sensing. Space remote sensing was first tried experimentally when cameras were used on manned orbital flights to take multispectral photographs of the Earth. Later, in 1973, Skylab was outfitted with sensors designed to the specifications of the Departments of the Interior and Agriculture, which used the data in programs that tested possible applications in planning, management and resource conservation [21].

The LANDSAT program began in July 1972 when the first LANDSAT satellite (the Earth Resources Technology Satellite-1) was launched by NASA. The program began as a research and development effort to determine the usefulness of satellite multispectral information, provided as synoptic views of the Earth's surface [22]. In the ten years that followed three more LANDSAT satellites were launched so that a continuous flow of information about the earth's surface was transmitted over an extended period of time. LANDSAT data has been used regularly in a wide range of applications from crop forecasting to mapping, to land use planning and resource management. The program has developed into a valuable source of information for agricultural and urban planning, geologic exploration, land management studies, snow melt and flood runoff analysis, crop stress location and other tasks requiring large-scale views of the Earth's surface areas.

LANDSAT D (LANDSAT 4) was launched July 16, 1982 into a polar orbit at an altitude of 705 kilometers. It circles the Earth every 98.9 minutes and images the same 185 kilometer swath of the Earth's surface every 16 days. A follow-on satellite, LANDSAT D', is available to replace or supplement LANDSAT D.

The LANDSAT data collection system consists of the LANDSAT D satellite in orbit, the LANDSAT D' satellite currently in storage, a communications satellite system, ground receiving stations, a ground data processing and satellite control facility, and a data distribution center.

2.1 LANDSAT D and D' Satellites

LANDSAT D (and D') illustrated in Figure 2.1, consists of the Standard Multi-Mission Modular Spacecraft and a mission unique instrument module. The spacecraft, which is compatible with Space Shuttle launch and retrieval, contains the

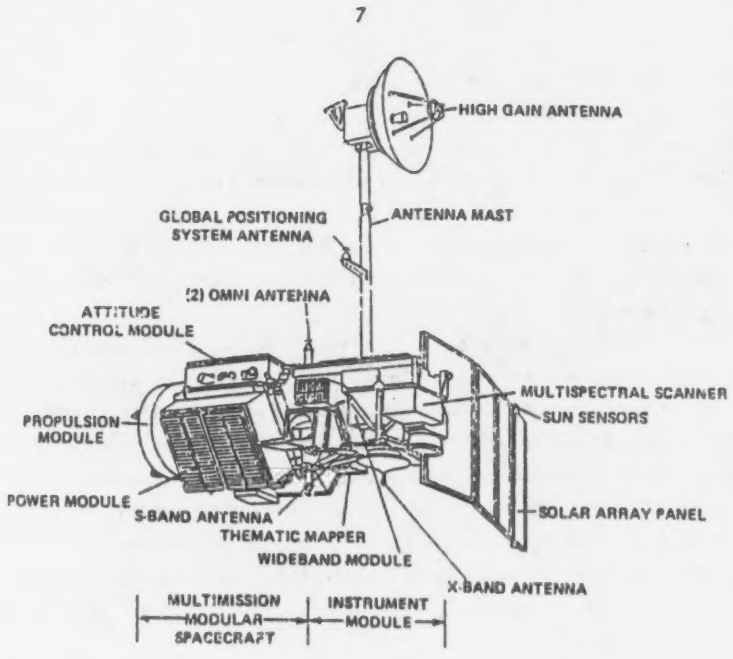

FIGURE 2.1 LANDSAT D FLIGHT SEGMENT

attitude control, communications, data handling and power subsystems. Included in the instrument module are the Multi-Spectral Scanner (MSS), Thematic Mapper (TM), a wideband communications subsystem, high-gain and other antennas, and a solar array that can generate two kilowatts of power. The MSS is a radiometer, an instrument that collects and measures energy reflected or emitted in discrete intervals of the electromagnetic spectrum. It has four spectral bands in the visible and near infrared portions of the spectrum and has an 80 meter spatial resolution. The TM works like the MSS but is a seven band multispectral, high resolution scanner with 30 meter spatial resolution [20].

2.2 Communications System

Until the launch of NASA's Tracking Data Relay Satellite System (TDRSS), data coming directly from LANDSAT D will be received by ground receiving stations located in the U.S. and 11 foreign countries. Coverage is limited by receiving station line-of-sight, since LANDSAT D has no on-board recording capability. The U.S. has arranged to receive foreign scenes by mail from these

stations albeit sometimes with long delays. Once TDRSS is in operation it will receive data from LANDSAT and transmit it to a ground receiving station at White Sands, New Mexico. This location was selected to minimize propagation effects on the TDRSS down-link. The positioning of the satellites in the TDRS system (one at 41°W and one at 171°W longitude) will allow for data acquisition from nearly all of the earth's surface. Foreign ground stations will continue to collect data for their own use directly from the satellite and can obtain other scenes from the U.S. facility at Sioux Falls.

Data received at White Sands is demodulated, separated and recorded on separate wideband data recorders. Compacted raw data tapes are prepared and transmitted via a domestic communications satellite (hereinafter referred to as DOMSAT) from White Sands to the processing facilities located at Goddard Space Flight Center in Greenbelt, Maryland with, under normal conditions, a data delay of no more than eight hours from sensor observation to availability for processing at GSFC. In the case of a DOMSAT failure of greater than two days, the raw data tapes will be mailed from White Sands to GSFC [23]. Once MSS data is processed at GSFC it is sent through DOMSAT to the EROS Data Center (EDC) at Sioux Falls, South Dakota.

The TDRSS and DOMSAT communications satellite systems will substantially reduce time delays that have been encountered in shipping data from foreign ground stations to the U.S. and from LANDSAT ground receiving stations to Goddard Space Flight Center, and subsequently to EDC.

2.3 Ground Segment

Raw data is received at GSFC, is stored on high density tapes (HDT_R) and sent to the Image Generation Facility for preprocessing, framing, radiometric correction and computation of geometric correction matrices, to produce a high density archival tape (HDT_A), in the case of MSS data. TM data is processed further, into computer compatible tapes and film [24]. Separate (computer) processing strings exist for MSS and TM processing.

User requests for data acquisition over specific land areas are input into the system through a mission management facility which sends such requests to the Control and Simulation Facility for spacecraft orbital operation planning and scheduling [24]. A basic data set is routinely acquired, but a user may make a request for "special acquisition data" (for which there is a fee). The mission

management facility also provides image data production management, management reporting, database management, control point library generation, inventory control and ground segment management.

Control and monitoring of the spacecraft, coordination of the ground schedules with the spacecraft, performance analysis and mission planning are handled by the Control and Simulation Facility [23].

Evaluation of the image data, with emphasis on assessing systems handling TM data, is conducted by the LANDSAT Assessment System [23]. Figure 2.2 illustrates the flow of information in the ground segment.

2.4 Data Distribution Center (EDC)

MSS data on high density archival tapes are relayed from GSFC through DOMSAT to the EROS data Center (EDC) located in Sioux Falls, South Dakota. At EDC the incoming data is recorded on high density tape, which is sent through the EROS Digital Image Processing System to ascertain readability, correct geometry and generate black and white 241 mm latent film. The film is processed into a film master and the HDT and film master are archived. When scenes are ordered, digital products will be generated from the HDT and film products from the film master [25].

Goddard-produced TM film will be inspected for quality and cloud cover and a working master generated and stored in the archives. TM digital data (on CCTs) will be inspected for physical defects [25]. Products will be produced from the film master or CCT to fill customer's orders.

The Center's computer complex controls a database of over six million images and photographs of the Earth's surface features [20].

Figure 2.3 illustrates the flow of information in the total LANDSAT system.

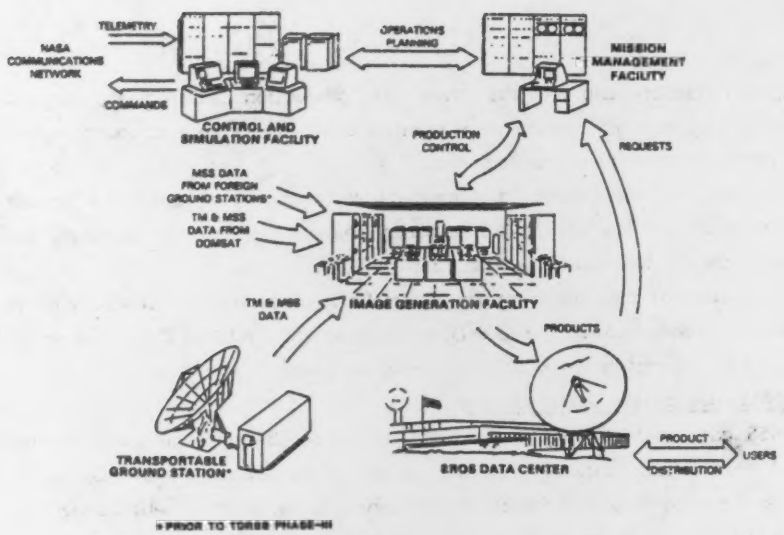

FIGURE 2.2 LANDSAT D GROUND SEGMENT

(SOURCE: LANDSAT D MISSION SYSTEM INDUSTRY BRIEFING, FEBRUARY 26, 1982)

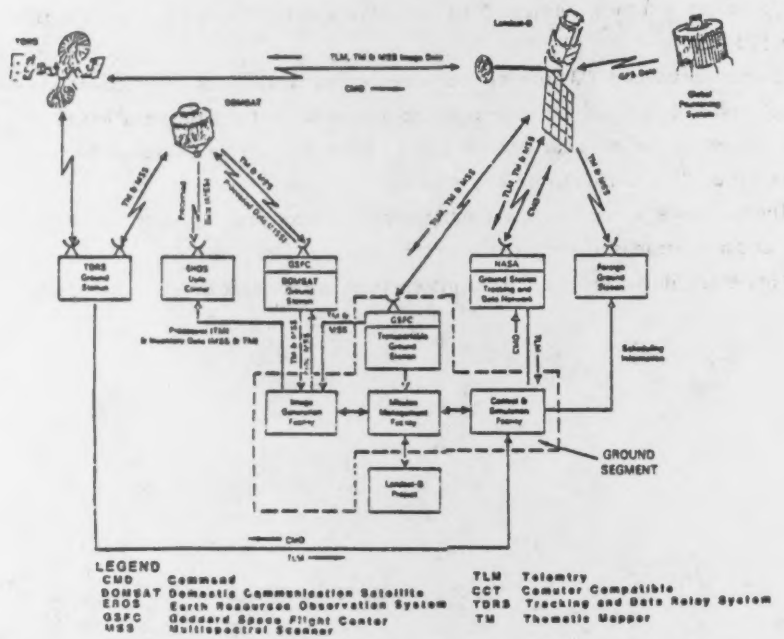

FIGURE 2.3 LANDSAT D SYSTEM OVERVIEW

(SOURCE: LANDSAT D MISSION SYSTEM INDUSTRY BRIEFING, FEBRUARY 26, 1982)

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3. THE BUSINESS SCENARIO

Underlying the analysis and comparison of the financial and organizational approaches for either transfer of the ownership and operation of the civil land remote sensing program to the private sector or government retention is a basic commonality. This commonality is with respect to the level of service provided in the marketplace and hence product sales. Thus a point of departure is a set of products having the same attributes (including price, resolution, timeliness, etc.) over time for each of the scenarios. The result is a demand forecast that is independent of scenario, a timeline or schedule of events that is independent of scenario, and a basic business concept that is independent of scenario. With these factors constant from scenario to scenario, attention can be focused on the relative attractiveness of scenarios, their affect on government cash flows, the impact of recoupment policies and other factors.

The anticipated schedule of events that is a major factor driving the costs of all the business scenarios is illustrated in Figure 3.1. For reasons to be discussed subsequently, it is assumed that commercial operation will commence at the start of fiscal year 1985. If this date is delayed, continuity of service will be jeopardized unless the federal government initiates procurement of another backup satellite (in addition to D'). A number of specific events and their timing (fiscal year) is shown. LANDSAT D was launched in FY82. It has already run into problems which have necessitated operations on backup subsystems. It is assumed that the multi-spectral scanner (MSS), having 80 meter resolution, will fail at the end of FY85 and the thematic mapper (TM), having 30 meter resolution, will fail at the end of FY84. It should be noted that specific failure dates have been assumed for events that are basically random in nature. It is assumed that the MSS is the primary sensor and that LANDSAT D' will be launched during FY85 in anticipation of an MSS failure. It is felt that this (launch on anticipation) is important to demonstrate the intention of continuity of service to potential users of the information products. LANDSAT D' also has an MSS and a TM. It is assumed that this TM will fail after approximately two years of service and that the MSS is placed into an in-orbit spare status at about the same time.

Immediately upon commercialization it is assumed that two LANDSAT Es will be procured. LANDSAT E will consist of the same "bus" used in LANDSAT D

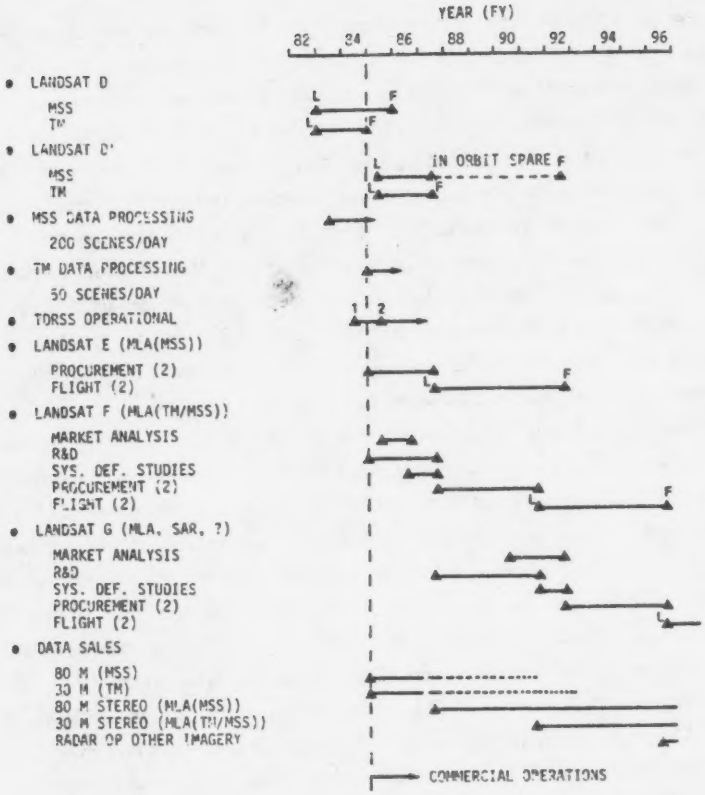

FIGURE 3.1 LAND OBSERVATION SYSTEM--ANTICIPATED SCHEDULE OF EVENTS

and LANDSAT D' (the Multi-Mission Spacecraft), plus a solid state version of the MSS—a multi-linear array having a stereo capability. The stereo capability allows the observation of scenes at different angles from the nominal ground track. This procurement must proceed with haste since in the absence of LANDSAT E there is no spare for the MSS on LANDSAT D' and continuity of service is in jeopardy. Continuity of service is deemed extremely important since, as will be discussed, the large part of the demand for information products is associated with renewable resources which require up-to-date information. Two spacecraft are procured in order to have a reasonable chance for the desired continuity of service. The 80 meter resolution MLA is indicated because time is of the essence, and the development of a 30 meter resolution MLA would require an extended development schedule. It is anticipated that the two LANDSAT E spacecraft together with the LANDSAT D' MSS on-orbit spare will provide service through FY92.*

During FY91 LANDSAT F, having a solid state version (multi-linear array) of the TM with 30 meter resolution, will be launched. It is assumed that the decision to develop LANDSAT F will be based upon a market analysis and that two spacecraft will be procured. These will last through the remainder of the planning horizon. Since it is likely that additional spacecraft will be required in the latter part of the 1990s, expenditures for their development and procurement (LANDSAT G) will be required during the planning horizon.

As will be discussed in Section 4, there is a need for both 80 meter and 30 meter resolution information products. LANDSAT F will have a 30 meter resolution capability. To satisfy both the 30 and 80 meter product needs, the 30 meter data will be degraded to produce 80 meter products as necessary. This will allow attribute pricing policies to continue and to provide the lower priced products required by the renewable resource community.

The basic concept of the land remote sensing business system is shown in Figure 3.2. It is assumed that the government will continue to perform R&D related to the development of sensors and associated technologies and new information extraction techniques. The results of this R&D will be available to the land observation venture. The land observation venture will utilize the tracking data relay satellite (TDRSS) and domestic communication satellite (DOMSAT)

*The question of number of spacecraft to be procured is addressed in Appendix A and is based upon the use of a stochastic mission and life cycle cost simulation model, SATIL.

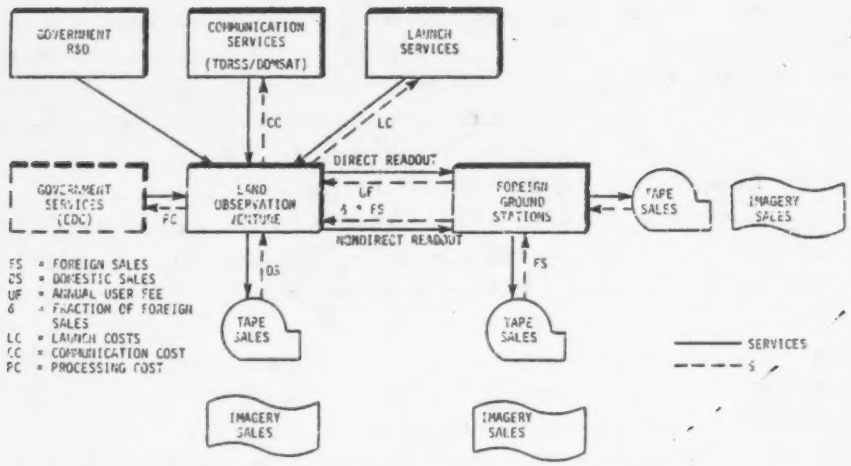

FIGURE 3.2 BASIC CONCEPT OF LAND REMOTE SENSING BUSINESS SYSTEM

services. The venture will also utilize launch services provided by either government or nongovernment operations.* It is assumed that initially the venture will utilize services (archiving and sales--not marketing) provided by the EROS Data Center which will be reimbursed for all costs incurred. The venture will, in essence, take over the Goddard Space Flight Center Data Processing Facility and the White Sands Ground Station. At an appropriate point in time, all data processing and sales facilities will be consolidated at White Sands (White Sands must remain since it was selected in order to minimize communication problems with the TDRSS).

*Launch services are a potential problem. The LANDSAT series is designed to be launched on a Delta vehicle. At present, NASA does not plan to have Delta vehicles available after the launch of LANDSAT D'. There are no definitive plans for commercialization of the Delta, although this is a possibility. In the absence of the Delta, there appear to be other possibilities--a West Coast Shuttle launch or the use of Ariane. Because LANDSAT series spacecraft are not optimized for Shuttle launch and the limited number of payloads to be launched from the West Coast, it is likely that the LANDSAT launch would be charged for a dedicated Shuttle flight. This would impose a significant penalty on the LANDSAT observation business venture. A new spacecraft could also be developed to reduce launch costs but development cost would be incurred. In the financial analysis considerations in Section 6 the cost of a Delta launch ($35 million--FY83$) has been assumed.

It is assumed that the foreign ground stations will be franchised, each having a region within which it is the sole supplier of information products. The foreign ground stations will continue to be able to obtain direct readout from the satellites when they are observable. Annual fees will be paid for this. Scenes so obtained can be distributed within the franchise area without restrictions. The foreign ground station will be responsible for sales in its region of information products that cannot be obtained by direct readout. Revenue from sales so obtained will be split with a portion maintained by the ground station and the remainder paid to the U.S. venture which will provide the necessary information products. The goal is to establish a foreign marketing organization using the existing ground stations as the starting point. Franchises may also be established without having a ground station.

Figure 3.3 illustrates the staged operations of the business system and the flow of information. Stage I utilizes the system configuration which will be in place in FY85. Stage II consolidates all functions at White Sands. During Stage I LANDSAT observation satellite data is transmitted via TDRSS to the tracking and readout facility at White Sands which communicates this data via DOMSAT to the system management and processing center at Goddard Space Flight Center (GSFC). Data is processed into information products at GSFC which then communictes the bulk of these products to EDC via DOMSAT. The foreign ground stations receive direct readout from the land observation satellite and also receive requested scenes from EDC.

During the second stage the data processing, archiving, sales and tracking, and control facilities are consolidated at White Sands. This allows the elimination of duplication of facilities and eliminates the need for DOMSAT communications.

The previously defined events schedule and business concepts serve as the common basis for evaluating the alternative financial and organizational scenarios.

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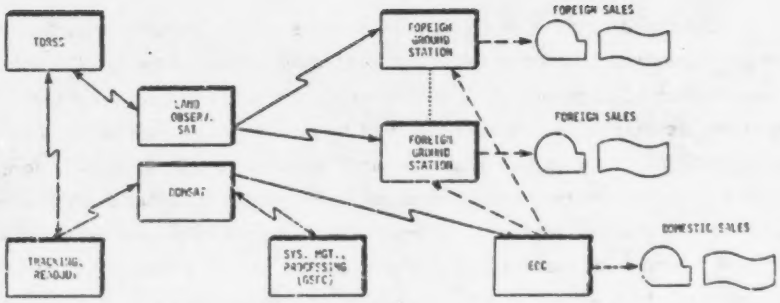
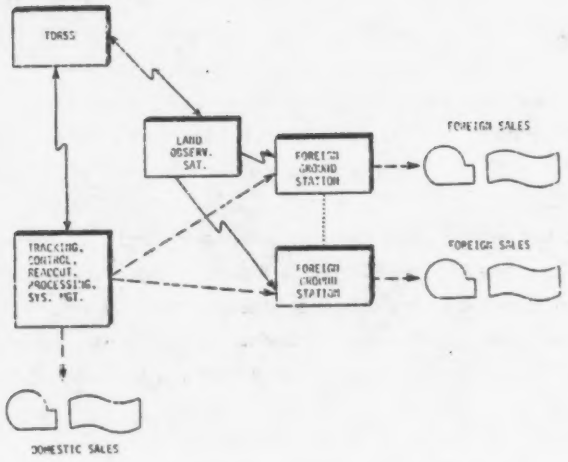


(A) STAGE I



(B) STAGE II

FIGURE 3.3 THE BUSINESS SYSTEM: STAGED OPERATIONS

4. THE MARKETPLACE

4.1 Products

LANDSAT D provides data from two sensors, the Multi-Spectral Scanner (MSS) and the Thematic Mapper (TM), which is processed into photographic images and computer digital tapes. Each LANDSAT scene covers an area whose dimensions are 185 kilometers on each side. Data is provided from the MSS in four spectral bands with a spatial resolution of approximately 80 meters. The TM obtains data in seven spectral bands with a spatial resolution of approximately 30 meters. Customers for resulting information products may order photographic images in film and paper, positive and negative format, in black and white and color, and in sizes from 70 mm to 40 inches.* Digital products may be ordered in partially or fully corrected formats.

The basic collected data and resulting processed information products have value only to the extent that they can be interpreted and applied in decision making and planning. In the years since the Multi-Spectral Scanner has been available, techniques have been developed to utilize the information products in a wide range of applications. Information acquired through analyses of LANDSAT data has demonstrated value in crop assessments and yield forecasts, forest and range inventory and monitoring, soil analysis, surface water delineation, land cover classifications, mapping, urban planning, location of oil and mineral resources and the understanding of the composition of the Earth's surface.

The Foreign Agricultural Service, for example, uses LANDSAT data in providing information to aid U.S. farmers and traders to adjust to changes in world demand for U.S. agricultural products [2]. Maps produced with the aid of LANDSAT data are being used by the Bureau of Land Management in their management of federal land, by the Corps of Engineers in conducting dam inspections, and by several states in urban land-use delineation and hydrologic land use planning [1]. Many oil and gas companies have developed in-house computer processing capabilities for LANDSAT data interpretation to assist in their world-wide exploration activities. This latter application has probably been the largest nonfederal user of LANDSAT tapes and imagery products.

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*A distinction is made between data products, the raw data prior to processing and information products, the processed data made available for sale in the form of imagery or digital tapes.

The increased resolution, new spectral bands, in addition to narrower bands in green, red and near infrared of the Thematic Mapper offer advantages beyond those of the Multi-Spectral Scanner and, consequently, increased value in applications. However, TM data is costlier than MSS data ($2,800 for a TM scene in tape format versus $650 for an MSS scene in tape format), and for some uses the increased content of a TM scene may not justify the higher costs.

New spectral bands will enable differentiation among a wider variety of crops, vegetation, rock and soil types than was possible with the MSS. Measurement of surface temperature will allow identification of plant health and improve identification of individual plant type, and may be used in identifying and mapping surface composition for geological studies.

Increased spatial resolution will permit more effective use of data in land use mapping and planning, storm water management and geologic mapping because features are more distinct in TM observations.

4.2 Customers

Users of information products from a land remote sensing system have different needs (based upon applications) for specific product attributes such as spatial resolution, number and location of spectral bands, frequency of observation, timeliness of delivery of information, and area of coverage. The users of the information products, depending upon applications, require information products that are packaged in different forms ranging from film to high density digital tapes. Some users require a large number of scenes on a repetitive basis (the renewable resource applications) while others require a small number of scenes on a nonrepetitive basis (the nonrenewable resource applications). The former applications generally have relatively low value per scene whereas the latter applications have relatively high value per scene.

The major user of LANDSAT data has been the federal government, although its share of total U.S. distributions of information products has declined to about 33 percent [20]. It is estimated that in FY83, $7 to $8 million will be allocated among federal agencies for LANDSAT data. Within the federal government, the largest user is the Department of Argiculture with a budget estimated to be slightly in excess of $3.5 million in FY83 for data acquired over foreign areas and $150,000 on domestic data. For the Foreign Agricultural Service, LANDSAT is the only way to obtain global crop information. In domestic crop monitoring,

alternative means do exist for collecting data. Aerial photography, district rangers, county agents and extension workers are used regularly, especially during the growing seasons. Because of anticipted budget constraints coupled with the agencies use of large quantities of LANDSAT data, it is not likely to shift to the use of the more expensive TM data on a significant scale. Timeliness of delivery and frequent observations are critical to the value of the data. Based upon previous benefit estimates [26-29] it appears that USDA budgets* for information products bear little or no relationship to the potential benefits.

Among the other federal government users are the CIA, Department of Interior, DOD and NASA. It is estimated that their combined FY83 expenditures for information products will be of the same order as the USDA's. The information products will be used for both renewable and nonrenewable resource management applications.

State and local government users constitute a small segment of the market; about 5 percent of the nonfederal market [20]. They are low volume users. Many states have developed internal data analysis capabilities [7]. The largest number of state applications have been in environmental management, forest/rangeland management, and water resources planning and management [12]. Higher resolution images over urban and suburban areas are valuable to urban planners concerned with changing land use patterns [30].

Academic institutions use LANDSAT data in research or teaching. Some purchase data to perform value added services for state and local government organizations or other clients [12].

The industrial sector is the second largest market category and is dominated by the resource exploration industries—particularly oil, natural gas and mineral exploration companies [31]. Frequent coverage and timely delivery are not as vital as in the renewable resources area. Usually seasonal coverage and delivery within the month is adequate. During the past few years firms that have been actively using LANDSAT data have developed in-house processing facilities and have established databases with scenes acquired during each of the four seasons. It is possible that this part of the market may approach saturation in the near-term. However, new firms are beginning to employ LANDSAT data, and so the market may be driven more by expanded number of users than by increased demand among

*Not including USDA information processing costs.

existing users [20]. Counterbalancing this trend is the worldwide petroleum glut, which has reduced speculative searches for new sources of petroleum.

The industrial market is characterized by relatively low data volumes but an ability to pay, which bears more of a relationship to value than the other market segments. Data, once acquired, has value for years afterwards. The new and narrower spectral bands of the Thematic Mapper data will be valuable in mineral and petroleum exploration, and a strong initial demand for TM data on the part of these users is anticipated. The industrial sector has expressed a desire to acquire stereo data which is not available from LANDSAT D and D' but will be available from the French SPOT System.

There has been limited operational use of multi-spectral data in the forestry industries. St. Regis Paper Company is now using MSS data in a forest resource information system [1]. Agribusinesses, although aware of the LANDSAT program, have been reluctant to actively use the data [31]. A recent market study identified potential private users with requirements which LANDSAT now has the potential to fill, including utilities, construction companies, agribusinesses, or which higher resolution MLA systems will fill, including mining engineering, bridge, tunnel and elevated highway construction contractors [31].

Foreign users have made up about one-third of total EDC data sales. The composition of the foreign sector is believed to be similar to the U.S. groups (federal, industrial, academic, and state and local governments) and will have similar requirements [20]. The developing countries and some developed countries (such as Canada, Australia to a certain degree, Brazil and South Africa, which have substantial areas, small but well trained scientific populations and economies which can support investments in remote sensing) place high value on the LANDSAT system [12]. For many developing countries there are no alternatives to LANDSAT's reliable, inexpensive provision of data on natural resources. Small countries, cloudy countries and countries with finely segmented landscapes do not have much interest in the present system, but look to future spacecraft imaging radars to overcome the cloud cover problem, and to SPOT and TM for high resolution and multi-spectral data [12].

4.3 Competition

Starting in 1984 LANDSAT will face competition if, as is currently scheduled, France launches its developmental satellite earth observation program, SPOT. The SPOT satellite will contain two identical high resolution visible (HRV) range instruments. These instruments will have a resolution of 20 meters in three spectral bands (in the visible and near infrared portions of the spectrum) and 10 meters in black and white. During ground processing, 20 and 10 meter resolution images can be combined into a product appearing to have an enhanced resolution beyond the multispectral image. A unique feature of the SPOT imaging system is the off-nadir viewing capability made possible through the use of multi-linear arrays (MLA) of solid state detectors. This allows revisit coverage at intervals from one to several days, and the ability to record stereoscopic pairs of images of a particular area. SPOT has a 26-day repeat cycle [32, 33].

A market for SPOT data is expected to be found among those involved in oil and mineral exploration, topographic and land use mapping, crop and environmental monitoring, coastal zone studies and general research activities. SPOT Image, the privately-owned company that will market SPOT, plans to establish agreements with ground stations, giving the stations exclusive rights to market SPOT within their own countries [33]. The payment fees to these stations are structured so as to be essentially proportional to the amount of data received by them. SPOT Image has tentatively priced their product (high density tape) at about $1,000 per scene. A SPOT scene is approximately one-fourth the area of a TM scene (currently priced at $2,800) and has three spectral bands, as compared to the TM's seven. The implications on the market can only be guessed, but it is likely that those applications that do not have need for full TM scenes will find SPOT somewhat less expensive.

4.4 Market Forecast

The past decade has seen many major developments in the state of the art of land remote sensing. A space hardware and a ground data processing technology base have been developed. An enormous amount of data have been collected from the LANDSAT satellites and have been processed into film and tape information products. These information products, having application in both renewable and nonrenewable resource management areas, have been available to and used by both federal and nonfederal customers. Considerable progress has been made toward the development of a good technology foundation upon which estimates and

projections can be made with respect to the cost and capability of data collection and processing. During this same time, however, little progress has been made with respect to understanding the market dynamics for resulting information products, although a number of market studies have been undertaken [31, 34, 35, 36]. Little information is available that relates potential sales of information products to the multiple attributes such as resolution, number of spectral bands, price and competition. Because of the brief period of performance of this reported study, it was not possible to develop new data—that is, it was not possible to perform an in-depth market study, nor was it possible to make independent cost and performance estimates. Since assessments and projections were necessary, they were made based upon review of previous work, the establishment of historical costs, performance and sales databases, and interviews with both users and suppliers of data products.

A summary of historical data is presented in Figure 4.1 and indicates thousands of MSS scenes (imagery plus tape) delivered as a function of time. Also indicated are the Department of Commerce estimates of MSS scenes that will be delivered in FY 1983 and 1984 [20]. It should be noted that there have been significant changes in pricing policy over the period of time shown, culminating with a large price increase (approximately two to three times) in October 1982 [30]. Also, TM scenes have recently become available and will cause a gradual switch by some users from MSS (80 meter) to TM (30 meter) information products.

The following paragraphs summarize the market forecasts that have been used in the financial analyses which are presented in Section 6 of this report. Because we have tried within the scope of the current effort to play the role of an entrepreneur formulating a business plan, the market forecasts are felt to be conservative—"blue sky" applications have not been included. Thus, there is likely to be considerable upside potential with but limited downside risk. Also, no consideration has been given to major changes in markets that may result from technology changes (for example, the impact of low cost processing on demand has not been considered) or from market development.

The market forecasts are based upon a market segmentation as indicated in Figure 4.2. The market forecasts are segmented by user (federal, industrial, state/local government/academia and foreign), product type (tape and imagery) and

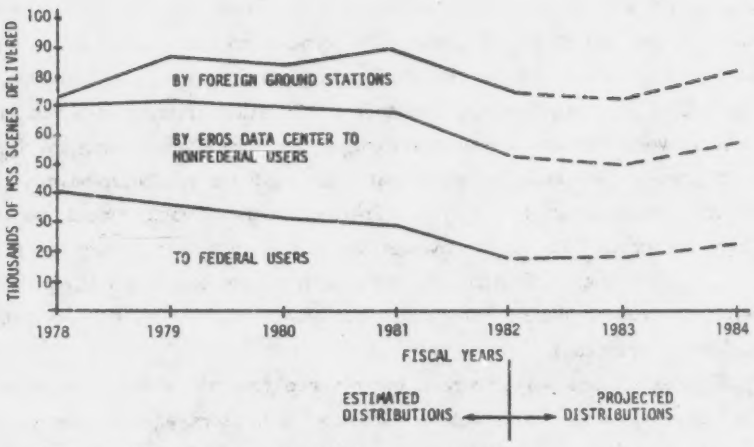

FIGURE 4.1 GLOBAL DISTRIBUTION OF MSS DATA ESTIMATED AND PROJECTED FISCAL YEARS 1978 THROUGH 1984

(SOURCE: TRANSFER OF THE CIVIL OPERATIONAL EARTH OBSERVATION SATELLITE TO THE PRIVATE SECTOR (DRAFT), U.S. DEPARTMENT OF COMMERCE, JANUARY 1983)

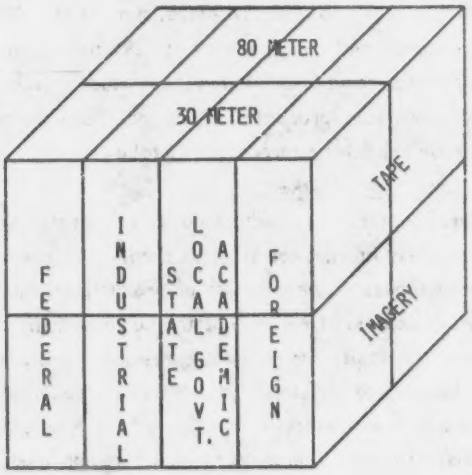

FIGURE 4.2 MARKET SEGMENTATION MODEL

resolution (30 and 80 meters). Thus forecasts have been made for 30 and 80 meter resolution tape and 30 and 80 meter film products to four market segments. It should again be noted that the information products have many attributes including medium (film or tape), resolution, number and location of spectral bands, timeliness of delivery, frequency of observation, proprietariness and dimensions of scene (partial scenes). It should be noted that many of these attributes have not been explicitly considered in this analysis primarily because of lack of data upon which to base forecasts. It should however be pointed out that pricing by product attribute (other than resolution and medium that have been explicitly considered herein) may prove to have great impact upon projected revenues. This is discussed in following paragraphs.

Figures 4.3 and 4.4 illustrate the revenue forecast and are based upon a review of previous studies as well as discussions with users, agencies and suppliers. Considerable judgment has been used in arriving at these figures, the rationale for which follows. Figure 4.3 presents the revenue forecast in constant 1983 dollars and Figure 4.4 presents the forecast in current dollars based upon a continuing 6 percent inflation rate. Since commercial ventures are being evaluated, current dollars are used in the financial analyses. The revenue forecast is based upon the specific timing of events as illustrated in Figure 3.1 (most important is the assumed TM failure in FY 1987 and re-establishment of a 30 meter capability in FY 1991), pricing policy and price elasticity estimates, market share estimates (assuming competition from SPOT and perhaps other sources), user transitions from 80 to 30 meter information products and nominal demand estimates.

The rationale behind the forecast is as follows:

Federal Government Market

The federal sector is characterized by relatively stable budgets which are likely to grow slightly (in real terms) with time. This growth will be primarily the result of price increases of the information products as price adjustments are made towards the maximization of revenue of the business entity. Information products will be acquired principally for renewable resource applications and there is some but little interest or need for stereo data (this data becomes available in FY 1987). The basic attitude of the federal market is to "buy American." This implies a very high market share for a U.S. commercial corporation independent of competition from foreign entities. Because of the large quantity of data required on a continuing oasis for monitoring the renewable resources, it is important to acquire

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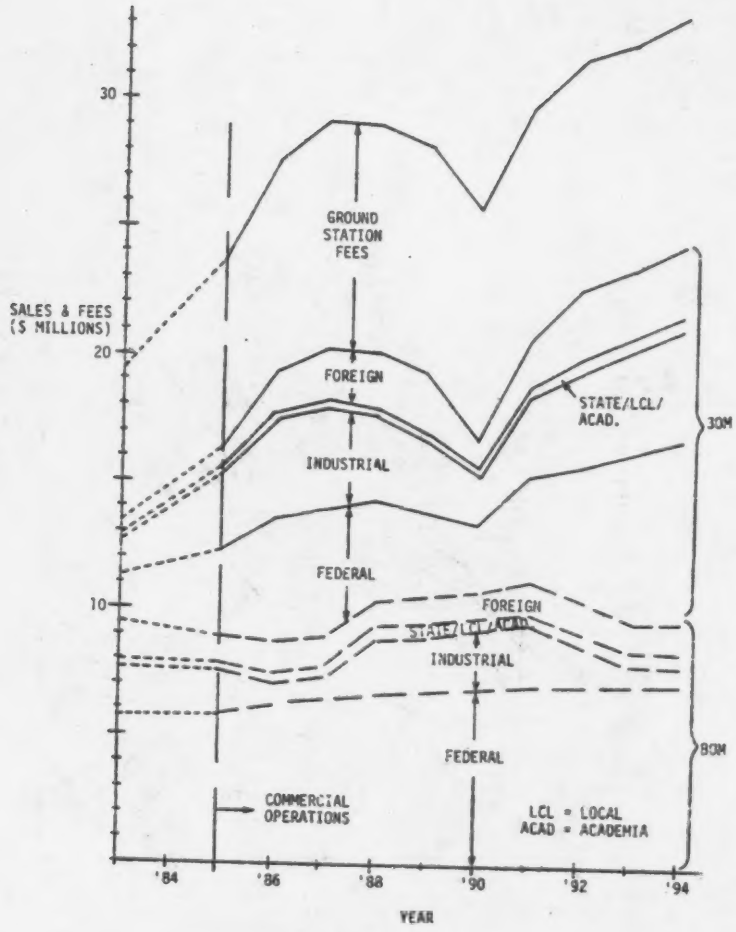

FIGURE 4.3 REVENUE FORECAST BY MARKET SEGMENT AND PRODUCT CLASS (CONSTANT 1983 DOLLARS)

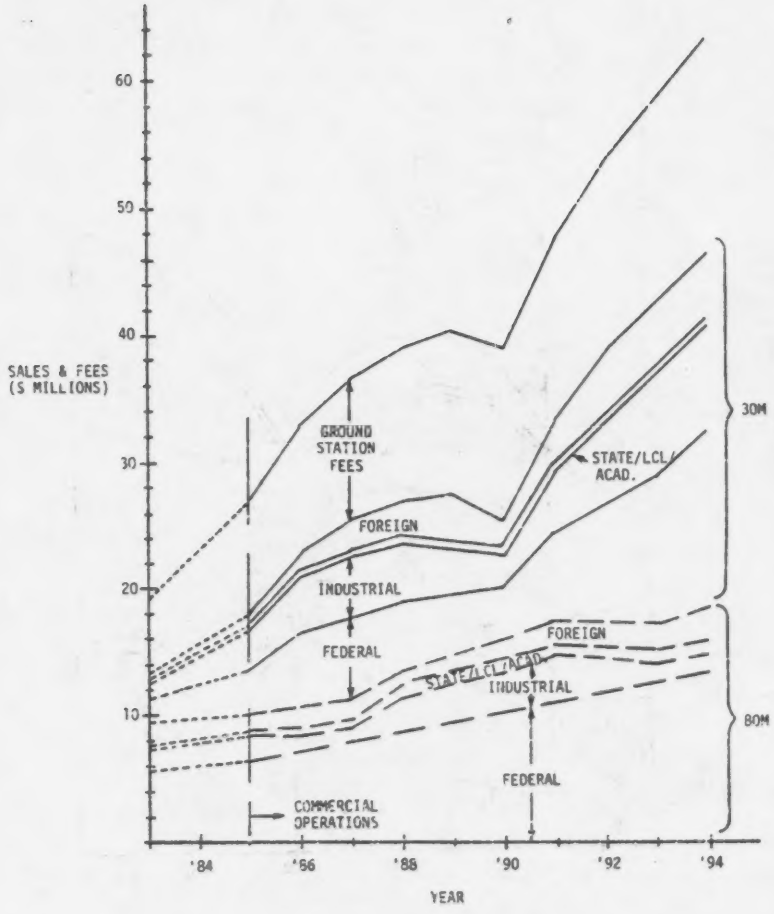

FIGURE 4.4 REVENUE FORECAST BY MARKET SEGMENT AND PRODUCT CLASS
(CURRENT DOLLARS - 6% ANNUAL INFLATION RATE)

low price information products. This is the primary reason for assuming continued reliance upon 80 meter information.

It is assumed that the demand for 80 meter information products will remain relatively constant with time. The demand is basically related to renewable resources. Of particular importance are information products concerning foreign agricultural products. Although 30 meter resolution may be desirable, it is anticipated that the combination of large volume required and high price will, to a large extent preclude its use for renewable resource applications. It is assumed that the demand for these products will continue well into the future and will be independent of the availability of higher resolution information products. It is also assumed that USDA's domestic agricultural reporting services will not rely upon remotely-sensed data. If this changes, then the demand (together with budgets) will increase, possibly by several thousand scenes per year. This would necessitate a budget growth and is probably the only major growth area in the federal sector.

With respect to 30 meter data there is little or no historical data upon which to base forecasts because 30 meter data has not been available until recently. It is assumed that 30 meter information products will be used primarily for experimentation and for nonrenewable resource applications. For these applications, because of the relatively small volume of data required, higher prices can be afforded and 30 meter information is more attractive than 80 meter information. When the LANDSAT D' thematic mapper fails, it is assumed that data purchases will continue (but at a decreasing rate) from archived data. When an operational thematic mapper or its 30 meter equivalent is reintroduced, 30 meter information product sales will pick up and prices will be increased as adjustments are made towards the maximization of revenue. Again, the basic attitude of the federal market is to "buy American." Because of the nonrenewable resource applications, there will be some increase in demand due to the availability of stereo data.

Industrial Market

It is assumed that during the decade of interest (the ten year span of the financial analysis) the resource exploration industry will continue to be the primary source of demand for information products. The market to date has been dominated by the resource exploration companies which currently are likely to continue to do their own data analysis. This implies that the cost of the data is but a small fraction of the total cost. The value of data products significantly exceeds the price paid for the products. Therefore, prices can be increased significantly without reducing the revenue.

Econ

It is anticipated that this market will be significantly impacted by the availability of 30 meter data. Therefore the demand for 80 meter products will fall off when 30 meter data becomes available from the thematic mapper. When stereo (80 meter) data is available, demand will increase until 30 meter stereo data is available. Since the market can stand significantly higher prices, attribute pricing may be used (nondiscriminatory) to further increase revenue by charging higher prices. If price is related to quantity purchased with significant price breaks for large quantities, prices may be kept low to federal users and high to industrial users. High prices would then also be charged to foreign and state/local users). Another alternative would be to charge by spectral bands—this is likely to separate by renewable and nonrenewable resources. The effect of this type of pricing, though not used in the financial analysis, is discussed in following paragraphs.

Industrial demand will continue to increase at a constant annual level. Market share will however decrease over time because of product availability from other sources, i.e., competition from SPOT and other systems. Market share for 80 meter products will stabilize at about 70 percent because of a basic "desire to buy American."

Market share for 30 meter products will be more directly affected by SPOT and the unavailability of new 30 meter data because of the assumed demise of LANDSAT D'. Thus, market share will erode to a low of 30 percent in 1990 before again increasing and stabilizing at about 60 percent.

State/Local Government/Academia

This industry segment is characterized by relatively small budgets for the acquisition of information products. It is anticipated that budgets will increase slowly with time as the value of the information products becomes an accepted fact. Information products will be used primarily for nonrenewable resource applications and for research. Because of the large area covered by a scene and slow changes being observed, a relatively small demand is forecast. It is anticipated that 30 meter products will be desired but that due to the relatively high price and fixed budgets, a relatively large quantity of 80 meter products will be acquired. It is anticipated that the bulk of the information products will be purchased from a U.S. source.

Foreign Market

The foreign market consists of franchising foreign ground stations and receiving annual user fees and the sale of information products through these ground stations. It is assumed that the number of franchised ground stations will remain relatively constant over the next decade. It is assumed that maintaining and demonstrating continuity of data will be important in maintaining an active franchise operation.

It is assumed that the foreign ground stations will sell information products that they cannot receive by direct readout. These information products will be obtained from the U.S. organization. It is assumed that 25 percent of the revenue obtained from these sales by the foreign ground stations will be kept by the ground stations and 75 percent of the revenue will be paid to the U.S. organization for the information products.

It is assumed that the foreign demand for 80 meter information products will continue to grow for several years and will then stabilize. If foreign countries decide to acquire worldwide renewable resource data (such as USDA's Foreign Agriculture Service does) this demand could increase significantly. It is assumed that competitive systems will make significant inroads with respect to market share.

Similar forecasts apply for 30 meter information products. Very significant growth is forecast in this area. However, market share will be significantly eroded by competition and the lack of new 30 meter data resulting from the gap caused by failure of LANDSAT D' and the launching of LANDSAT F.

In summary, it is anticipated that revenue from 80 meter information products will remain relatively constant over the next decade. This is the result of a combination of many factors including a slow growth in basic demand for renewable resource applications, the availability of 80 meter stereo data, competition from other systems and the availability of 30 meter information products. It should be noted that the use of satellite data by the USDA domestic reporting services could change this forecast substantially. Also, the use of worldwide crop information on a continuous basis by other nations could also substantially increase the forecast. It is anticipated that revenue from 30 meter information products will increase substantially over the next decade. The growth will be significantly affected by an anticipated gap in the availability of new 30 meter information products (this is the primary reason for the dip (1988-1990) in 30 meter revenue)

and competition from other satellite systems. It has been assumed that there will be only one U.S. organization providing information products. More will be said about this in Section 8.

The revenue forecast is based upon the detailed data presented in Figures 4.5 and 4.6 (all in constant 1983 dollars) for 80 meter and 30 meter information products, respectively, and the price elasticity estimates presented in Figures 4.7 and 4.8. Price elasticity was established by estimating the quantity which would be sold at three different price levels. Two straight lines are passed through the three points as illustrated in Figure 4.7 thus establishing the price-quantity relationship. The specific estimates utilized are presented in Figure 4.7 and illustrated graphically in Figure 4.8.

Referring to Figure 4.8, the dotted curves indicate unit elasticities or constant annual budgets (i.e., price x quantity = annual budget). When the solid curves are above the dotted curves it is implied that budgets will be increased to accommodate price increases. It is thus evident that the federal users have been assumed to be budget constrained within a year (it is assumed that budgets can vary from year to year as indicated by the nominal prices and quantities in Figures 4.5 and 4.6. However, as prices are varied from their nominal values, quantities are adjusted according to the assumed elasticities). As prices increase, quantities demanded decrease by approximately the same amount. This is in contrast to the industrial sector where it is assumed that significant price increases will have but little effect on demand. The state/local government/academia segment is also assumed to be budget constrained but to a slightly lesser degree (because of diversity) than the federal sector. The foreign sector, assumed to be a composite of the three other sectors, is assumed to have some budget flexibility but less than that of the industrial sector.

A few comments must be made with respect to optimum pricing, that is. pricing to maximize revenue. The optimum price is established by finding the point of tangency of the constant budget (by varying the budget level) curve with the price elasticity curves presented in Figure 4.8. Assuming that nondiscriminatory attribute pricing can be achieved so that the optimum price can be charged in each market segment, then the price and revenue as indicated in Table 4.1 can be achieved. Table 4.1 indicates optimal price to the federal sector is 2.5 times the nominal price used in the analysis with a resulting revenue of 1.25 times that assumed. The net effect of such optimum pricing (across all market segments)

FEDERAL MARKET (80 METER RESOLUTION)

	YEAR 1983	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
NOM.PRICE											
TAPE	650	650	650	650	650	650	650	650	650	650	650
FILM	45	45	45	45	45	45	45	45	45	45	45
NOM.QUANT											
TAPE	7600	7600	7600	7600	7600	7600	7600	7600	7600	7600	7600
FILM	20085	20085	20085	20085	20085	20085	20085	20085	20085	20085	20085
ACT.PRICE											
TAPE	650	650	700	750	800	850	900	1000	1000	1000	1000
FILM	45	45	50	55	60	65	70	75	75	75	75
ACT.QUANT											
TAPE	7600	7600	7366	7132	6898	6665	6431	5963	5963	5963	5963
FILM	20085	20085	19192	18300	17407	16514	15622	14729	14729	14729	14729
MKT SHARE											
TAPE	100	100	100	100	100	100	100	100	100	100	100
FILM	100	100	100	100	100	100	100	100	100	100	100
REVENUE											
TAPE	4940000	4940000	5156308	5349231	5518769	5664923	5787692	5963077	5963077	5963077	5963077
FILM	903825	903825	959617	1006482	1044420	1073432	1093517	1104675	1104675	1104675	1104675
TOTAL	5843825	5843825	6115924	6355712	6563189	6738355	6881209	7067752	7067752	7067752	7067752

INDUSTRIAL MARKET (80 METER RESOLUTION)

NOM.PRICE											
TAPE	650	650	650	650	650	650	650	650	650	650	650
FILM	45	45	45	45	45	45	45	45	45	45	45
NOM.QUANT											
TAPE	2000	2000	1000	1000	3000	3000	3000	3000	2000	1000	1000
FILM	10000	6000	4000	4000	6000	6000	6000	6000	3000	3000	3000
ACT.PRICE											
TAPE	650	650	700	750	800	850	900	1000	1000	1000	1000
FILM	45	45	50	55	60	65	70	75	75	75	75
ACT.QUANT											
TAPE	2000	2000	996	992	2965	2934	2902	2919	1946	973	973
FILM	10000	6000	3991	3982	5960	5947	5933	5947	2960	2960	2960
MKT SHARE											
TAPE	100	100	98	96	80	78	78	78	78	78	78
FILM	100	100	95	90	90	78	78	78	78	78	78
REVENUE											
TAPE	1300000	1300000	662442	669808	1897846	1883077	1853654	2043462	1367308	681154	681154
FILM	450000	270000	189578	197120	284090	289900	290733	297200	132400	132400	132400
TOTAL	1750000	1570000	852020	866928	2183936	2172977	2144387	2340662	1517708	836884	836534

STATE/LCL GVT/ACAD MARKET (80 METER RESOLUTION)

NOM.PRICE											
TAPE	650	650	650	650	650	650	650	650	650	650	650
FILM	45	45	45	45	45	45	45	45	45	45	45
NOM.QUANT											
TAPE	320	320	400	400	450	500	300	300	300	300	300
FILM	1500	1700	1900	2100	2300	2500	2500	2500	2500	2500	2500
ACT.PRICE											
TAPE	650	650	700	750	800	850	900	1000	1000	1000	1000
FILM	45	45	50	55	60	65	70	75	75	75	75
ACT.QUANT											
TAPE	320	320	391	382	419	454	442	419	419	419	419
FILM	1500	1700	1837	1960	2070	2167	2083	2000	2000	2000	2000
MKT SHARE											
TAPE	100	100	100	100	90	88	90	90	90	90	90
FILM	100	100	100	100	90	90	90	90	90	90	90
REVENUE											
TAPE	208000	227500	273538	286154	361569	347192	358269	377308	377308	377308	377308
FILM	67500	76500	91833	107800	111780	126750	131250	135000	135000	135000	135000
TOTAL	275500	304000	365372	393954	473349	473942	489519	512308	512308	512308	512308

FOREIGN MARKET (80 METER RESOLUTION)

NOM.PRICE											
TAPE	650	650	650	650	650	650	650	650	650	650	650
FILM	45	45	45	45	45	45	45	45	45	45	45
NOM.QUANT											
TAPE	1250	1500	1650	1700	1800	1900	2000	2000	2000	2000	2000
FILM	14400	15000	16500	17000	18000	19000	20000	20000	20000	20000	20000
ACT.PRICE											
TAPE	650	650	700	750	800	850	900	1000	1000	1000	1000
FILM	45	45	50	55	60	65	70	75	75	75	75
ACT.QUANT											
TAPE	1250	1500	1625	1648	1717	1783	1846	1785	1785	1785	1785
FILM	14400	15000	16317	16622	17400	18136	18889	18667	18667	18667	18667
MKT SHARE											
TAPE	100	100	95	80	60	50	50	50	50	50	50
FILM	100	100	95	81	60	50	50	50	50	50	50
FEE SHARE	100	79	75	73	73	73	73	73	73	73	73
REVENUE											
TAPE	812500	731250	810277	741462	618092	568356	623077	669231	669231	669231	669231
FILM	648000	506250	881281	848533	469800	442342	497833	525000	525000	525000	525000
TOTAL	1460500	1237500	1391358	1289995	1087892	1010697	1118910	1194231	1194231	1194231	1194231

TOT REVEN											
TAPE	7260500	7198750	6902365.	7046654.	8336277.	8463348.	8622692.	9053077.	8371923.	7690769.	7690769.
FILM	2069325	1736675	1822309.	1859935.	1913080	1932623.	2011333.	1971875	1930075	1 730075	1920075
TOTAL	9329825	8935425	8724674.	8906589.	10249357	10396171	10634025	11024952	10291998	9 420844.	9610844.

FIGURE 4.5 MARKET FORECAST FOR 80 METER DATA PRODUCTS
(CONSTANT 1983 DOLLARS)

Econ

FEDERAL MARKET (30 METER RESOLUTION)

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
NOM.PRICE					YEAR								
TAPE	2800	2900	2900	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800
FILM	45	45	45	45	45	45	45	45	45	45	45	45	45
NOM.QUANT													
TAPE	570	1000	1500	1300	1350	1500	800	1200	1350	1800	1800	1800	2000
FILM	6800	10000	13900	13900	12000	10990	8000	13990	13000	18000	18000	18000	20000
ACT.PRICE													
TAPE	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800
FILM	45	45	50	55	60	65	70	75	75	75	75	75	75
ACT.QUANT													
TAPE	570	1000	1500	1500	1350	1000	800	1166	1414	1671	1829		
FILM	6800	10000	14352	13667	10400	8333	6222	8800	11000	13200	14667		
MKT SHARE													
TAPE	100	100	100	100	100	100	100	100	100	100	100		
FILM	100	100	100	100	100	100	100	100	100	100	100		
REVENUE													
TAPE	1596000	2856000	4200000	4200000	3360000	2800000	2240000	3097143	3937143	5027714	5040714	5040714	5617143
FILM	306000	450000	718667	751667	630000	524444	433556	660000	825000	990000	1080000		
TOTAL	1902000	3306000	4918667	4951667	3990000	3324444	2673556	4157143	4762143	6017714	6120714	6300714	7217143

INDUSTRIAL MARKET (30 METER RESOLUTION)

NOM.PRICE													
TAPE	1800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800
FILM	45	45	45	45	45	45	45	45	45	45	45	45	45
NOM.QUANT													
TAPE	500	1000	1500	2500	2000	3000	2500	2000	2000	2000	2000	2000	2000
FILM	1000	2500	3000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
ACT.PRICE													
TAPE	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800
FILM	45	45	50	55	60	65	70	75	75	75	75	75	75
ACT.QUANT													
TAPE	700	1000	1500	2000	2000	2000	2000	1993	1986	1982	1979		
FILM	1000	2500	3993	3982	3973	3964	3956	3947	3947	3947	3947		
MKT SHARE													
TAPE	100	100	90	70	60	50	50	80	60	60	60		
FILM	100	100	90	70	60	50	50	50	60	60	60		
REVENUE													
TAPE	1470000	2800000	3780000	3920000	3360000	2800000	2240000	2997286	3812571	3924643	4036286		
FILM	45000	90000	134700	153316	143040	128844	83067	148040	177600	177600	177600		
TOTAL	1485000	2890000	3914700	4073316	3503040	2928844	1763067	3137286	3990171	4102243	4213886		

STATE/LOCAL GVT/ROAD MARKET (30 METER RESOLUTION)

NOM.PRICE													
TAPE	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800
FILM	45	45	45	45	45	45	45	45	45	45	45	45	45
NOM.QUANT													
TAPE	10	20	70	100	100	100	100	100	100	100	100	100	100
FILM	1000	1500	1900	1200	1000	1500	1090	1000	1000	1000	1000	1000	1000
ACT.PRICE													
TAPE	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800	2800
FILM	45	45	50	55	60	65	70	75	75	75	75	75	75
ACT.QUANT													
TAPE	10	20	70	100	100	100	100	98	96	93	91		
FILM	1000	1500	1480	1139	900	867	833	800	800	800	800		
MKT SHARE													
TAPE	100	100	100	90	80	70	70	80	90	100	100		
FILM	100	100	100	90	80	70	70	80	90	100	100		
REVENUE													
TAPE	28000	140000	378000	392000	224000	196000	196000	234857	273657	312321	318143		
FILM	45000	67500	72990	53460	43200	39433	44833	60000	54000	60000	60000		
TOTAL	73000	207500	282990	267440	267200	235433	224833	282857	327657	372321	378143		

FOREIGN MARKET (30 METER RESOLUTION)

NOM.PRICE													
TAPE	1823	2870	2860	2803	2800	2800	2790	2857	2800	2800	2800		
FILM	45	45	45	75	45	45	45	42	45	45	45		
NOM.QUANT													
TAPE	150	260	600	1000	1400	1800	2200	2000	2857	2800	2800		
FILM	1500	3000	6000	10000	14000	18000	20000	20000	20000	20000	20000		
ACT.PRICE													
TAPE	2801	2870	2860	2860	2800	2800	2800	2800	2800	2800	2800		
FILM	45	45	50	55	60	65	70	75	75	75	75		
ACT.QUANT													
TAPE	150	260	600	1000	1400	1800	2000	1971	1943	1929	1914		
FILM	1500	3000	5973	9978	13933	17900	18889	18867	18867	18867	18867		
MKT SHARE													
TAPE	100	100	95	80	60	50	50	60	50	90	50		
FILM	100	100	95	80	60	50	50	60	50	80	50		
FEE SHARE	100	75	75	75	75	75	75	75	75	75	75		
REVENUE													
TAPE	420000	620000	1197000	1680000	1764000	1890000	1260000	1774286	2331429	2296667	2460714		
FILM	67500	101250	211373	322867	260400	219780	297780	420000	525000	525000	525000		
TOTAL	487500	721250	1408373	2002867	2129400	2309220	1557780	2194286	2856429	2911667	2985714		

TOT REVEN

TAPE	7644100	6370000	9387000	10482000	8708000	7686000	5376000	8998571.	10948371	12139286	13012286		
FILM	66.7%0	7%0750	1138202.	1283400.	1175640	1121972.	884958.0	1276000	1581600	1783600	1862400		
TOTAL	7744750	7%0750	10522202	11329099	9883640	8807972.	6260958.	10274571.	12529971	13891886	14874686		

FIGURE 4.6 MARKET FORECAST FOR 30 METER DATA PRODUCTS
(CONSTANT 1983 DOLLARS)

Econ

PRICE QUANTITY DATA	FEDERAL		INDUSTRIAL		STATE/LCL GVT/ACAD		FOREIGN	
	FILM	TAPE	FILM	TAPE	FILM	TAPE	FILM	TAPE
PRICE X1	1	1	1	1	1	1	1	1
X2	2	2	2	2	2	2	2	2
X3	3	3	3	3	3	3	3	3
QUANT #1	1	1	1	1	1	1	1	1
#2	.6	.6	.98	.95	.7	.7	.9	.8
#3	.4	.4	.8	.8	.4	.4	.6	.6

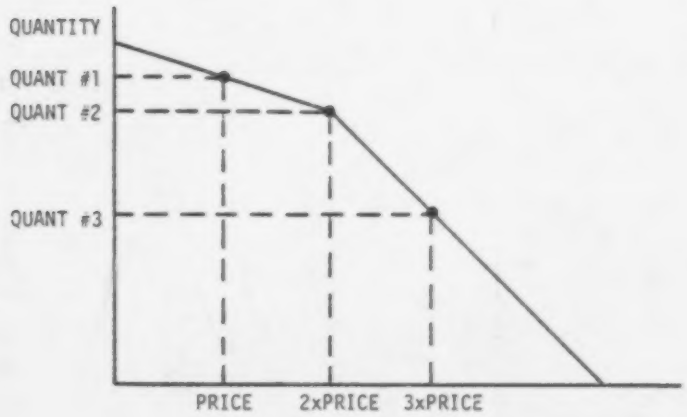

FIGURE 4.7 ANTICIPATED PRICE ELASTICITY

Econ

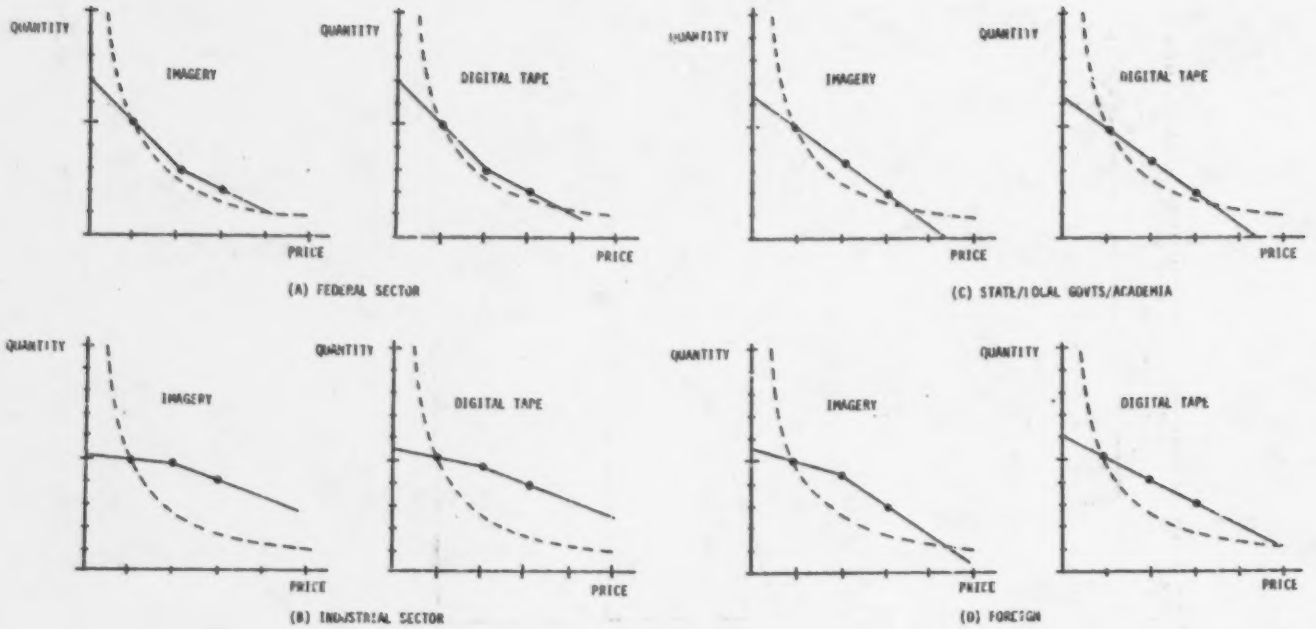

FIGURE 4.8 ANTICIPATED PRICE ELASTICITY BY MARKET SEGMENT

USGS

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TABLE 4.1 OPTIMUM PRICE & RESULTING REVENUE (RELATIVE)				
MARKET SECTOR	IMAGERY		TAPE	
	PRICE	REVENUE	PRICE	REVENUE
FEDERAL	2.5x	1.25x	2.5x	1.25x
INDUSTRIAL	3.7x*	2.5x*	4.2x	2.6x
STATE/LOCAL/ACAD.	2.2x	1.4x	2.2x	1.4x
FOREIGN	2.5x	1.9x	3.0x	1.8x

*A PRICE INCREASE RELATIVE TO THE NOMINAL PRICE OF 3.7 TIMES RESULTS IN A REVENUE INCREASE OF 2.5 TIMES.

would be to approximately double the estimated total revenue. While this looks very tempting there are problems: competition will generally drive these prices down as will lack of knowledge of the true price-elasticity curves. Therefore, the conservative pricing policy indicated in Figures 4.5 and 4.6, and modified by inflationary increases, was assumed with the gradual increase in prices assumed to seek out the optimum while countering competition and minimizing budgetary process problems particularly among federal, state and local government users.

5. FINANCIAL/ORGANIZATIONAL SCENARIOS (GENERAL)

As stated previously, the ECON efforts were concerned with the analysis and comparison of a limited number of financial and organizational approaches for either transfer of the ownership and operation of the civil operational land remote sensing program to the private sector or government retention. The following basic approaches for commercialization or retention were considered:

1. Continued ownership and operation by the federal government (planned phase-out)
2. Continued ownership and operation by the federal government (establishment of the necessary budgetary line items)
3. Wholly privately-owned and operated by an entity competitively selected
4. Phased private ownership (government ownership and operation with private sector marketing)
5. Legislatively-chartered, privately-owned corporation.

Each of these scenarios is described in the following paragraphs. Each of the scenarios is based upon the schedule of events as indicated in Figure 3.1 and the market and revenue forecasts as described in Section 4.

One of the most controversial issues surrounding commercialization is that of subsidies. Subsidies can take a variety of forms: direct cash subsidy payments; federal loans or loan guarantees; guaranteed federal purchases of information products at a unit price significantly higher than charged to other users; provision of free services such as satellite launches; special tax incentives; or other. The Administration has indicated its opposition to subsidization for commercial civil remote sensing on several grounds including [8]:

- Any form of subsidization (whether increasing cash outflow or reducing revenues) is opposed on the basis of budgetary impact on the efforts to balance the budget
- Subsidization in this area would set undesirable precedents in other areas
- If a commercialization initiative cannot stand the test of the marketplace, it should not be established at all.

This analysis of the various commercialization alternatives was jointly concerned with government cash flows as well as with the financial viability of the commercial endeavors (the feasibility of obtaining funding as well as continuing profitable operations). Because of the anticipated limited market for land remote

sensing information products, combined with the possible competition from remote sensing systems owned by or subsidized by foreign governments and the capital intensive nature of the business, it is shown in Section 6 that viable commercialization endeavors are not likely to be established without significant federal participation, either in the form of subsidies or major ownership/operatic is roies.

Again it is not possible to consider all subsidization forms or all levels of government ownership/operation. The specific subsidization forms considered include direct cash subsidy payments, equipment transfer values and recoupment policies, and government equity participation. The method of determining the need for subsidies and the specific form of the subsidies are described in Section 6. Three different levels of government participation were considered, namely: a) no participation except for possibly R&D and other support services, b) ownership/operation of the ground and space segments, excluding the marketing and sales functions, and c) ownership/operation of the ground and space segments including the marketing and sales functions.

5.1 Continued Ownership and Operation by the Federal Government (Planned Phase-Out)

Shortly after President Reagan entered office it was announced that the Administration would terminate the commitment to land remote sensing satellite data continuity through the 1980s on the basis that

> It is the Administration's judgment that the present NASA investment in LANDSAT is sufficient to permit evaluation of operational uses of LANDSAT data, and if these uses are cost-effective to attract a private sector owner/operator.
>
> NASA's program to develop, launch and test the two additional satellites already manufactured (LANDSAT D and D') will continue as previously planned. Expansion and extension of the U.S. civil land remote sensing program beyond that already funded by NASA is inconsistent with the need for across the board fiscal restraints....

The two additional satellites, frequently referred to as LANDSAT D" AND D"', then were deleted from the budget [8].

The implication of the above is that the federal government would continue to fund the ground and space segments and the related sales activities associated with remote sensing until the demise of LANDSAT D' or shortly thereafter (i.e.,

sales will most likely continue for the short-term). The annual cost associated with this planned phase-out scenario can be stated in general as*

Annual Fed. Gov't. Cost(I) = Operating Cost(I) + Storage Cost of D'(I)
+ Launch Cost of D'(I) + R&D Cost(I)
+ Gov't. Purchases from Other Sources(I)
- Gov't. Revenue from Nongov't. Sources(I)
+ Interest on Debt(I) - Tax Revenue(I).

This is restated in Table 5.1 together with the government cost computations resulting from the other considered commercialization and retention scenarios. The tax revenue results from taxation of private sector profits resulting from the government expenditures in the private sector. The interest on debt is the interest that must be paid by the federal government on borrowings made to cover the outlays made for the system. It can be shown that to a first order approximation, considering the magnitude of all of the other cost elements, the interest on debt and the generated tax revenue, which tend to offset one another, may be neglected.**

As per the schedule of events indicated in Figure 3.1, it is anticipated that LANDSAT D' will fail in the late 1980s (FY87 or FY88). Therefore, government operating costs associated with the operations of the land remote sensing system would be reduced to zero during this time period. However, government costs will not reduce to zero after the demise of LANDSAT D'. The reason for this is that government agencies will most likely continue to purchase information products from other sources. It can be argued that these purchases need not be made, and that federal budgets associated with land remote sensing can be eliminated. The counter to this argument is that there are benefits associated with the use of the remotely sensed data. These may be in the form of direct cost savings or other indirect benefits. These benefits will be foregone if the remotely sensed data is not used. If it is assumed that the benefits will exceed the cost of the information

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*I represents time, years.

**Tax Revenue = 0.5 x Gov't. Cost x Return on Sales(%)/100
Interest on Debt = Gov't. Cost x Interest Rate(%)/100
Interest on Debt - Tax Revenue = [Interest Rate(%) - 0.5 x Return on Sales(%)] x Gov't. Cost/100
= [8% - 0.5 x 10%] x Gov't. Cost/100
Therefore, neglecting interest on debt and generated tax revenues may introduce an error of 3 to 4 percent.

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TABLE 5.1 DETERMINATION OF GOVERNMENT COSTS*

SCENARIO	COST COMPUTATION**
1. GOVERNMENT OWNERSHIP AND OPERATION (PLANNED PHASE OUT)	OPERATING COST(I) + STORAGE COST OF D'(I) + LAUNCH COST OF D'(I) + R&D COST(I) + GOVERNMENT PURCHASE FROM OTHER SOURCES(I) - GOVERNMENT REVENUE FROM NONGOVERNMENT SOURCES(I) + INTEREST ON DEBT(I) - TAX REVENUE(I)
2. GOVERNMENT OWNERSHIP AND OPERATION (CONTINUED OWNERSHIP AND OPERATION)	SPACE SEGMENT COST(I) + GROUND SEGMENT COST(I) + INTEREST ON DEBT(I) - TAX REVENUE(I) - INDUSTRIAL SALES(I) - STATE/LOCAL GOVERNMENT/ACAD. SALES(I) - FOREIGN SALES(I) - USER FEES(I) + R&D COST(I)
3. PRIVATE OWNERSHIP AND OPERATION	GOVERNMENT PAYMENT FOR INFORMATION PRODUCTS(I) + OPERATIONS COSTS(I) - LEASE PAYMENTS(I) - ASSET RECOUPMENT PAYMENTS(I) - TORSS COST(I) - PROFIT SHARING OR ROYALTY ON SALES(I) + SUBSIDY PAYMENTS(I) + R&D COST(I) + INTEREST ON DEBT(I) - GENERATED TAX REVENUE(I)
4. PHASED PRIVATE OWNERSHIP (PRIVATE SECTOR MARKETING)	GOVERNMENT PAYMENT FOR INFORMATION PRODUCTS(I) + OPERATIONS COSTS(I) - PROFIT SHARING OR ROYALTY ON SALES(I) - GUARANTEED PAYMENTS(I) + R&D COST(I) + INTEREST ON DEBT(I) - GENERATED TAX REVENUE(I)
5. LEGISLATIVELY CHARTERED, PRIVATELY OWNED CORPORATION	GOVERNMENT PAYMENT FOR INFORMATION PRODUCTS(I) + OPERATIONS COSTS(I) - LEASE PAYMENTS(I) - ASSET RECOUPMENT PAYMENTS(I) - TORSS COST(I) - PROFIT SHARING OR ROYALTY ON SALES(I) + SUBSIDY PAYMENTS(I) + R&D COST(I) - GENERATED TAX REVENUE(I) + INTEREST ON DEBT(I) + EQUITY PURCHASE(I) - DIVIDENDS(I)

*ALL SCENARIOS UTILIZE THE SAME REVENUE FORECAST.
**I REPRESENTS TIME PERIODS (I.E., YEARS).

products (this appears to be a valid assumption since, if this were not the case, any form of commercialization would not be seriously considered) then the cost to the government and/or the general public (not necessarily in the form of budgetary items) after the demise of LANDSAT D' will equal or exceed the cost of the forecasted federal government purchases of information products. This is illustrated conceptually in Figure 5.1 and quantitative results are presented in Section 6.1.

5.2 Continued Ownership and Operation by the Federal Government (Establishment of the Necessary Budget Line Items)

It is assumed for this scenario that a government organization is established for providing land remote sensing operations on a continuing basis. It is

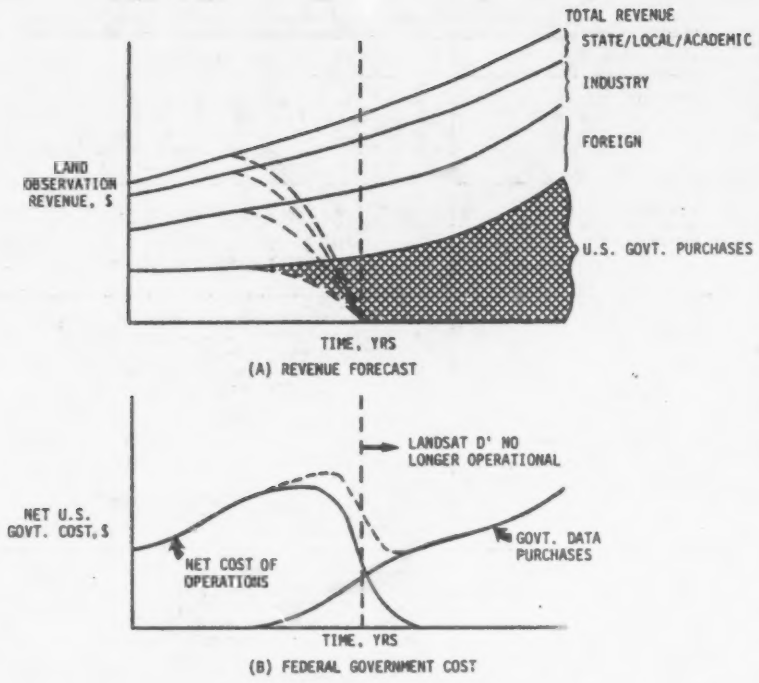


FIGURE 5.1 SCENARIO 1: GOVERNMENT OWNERSHIP & OPERATION (PLANNED PHASE-OUT)

assumed that the operations are based upon the event schedule presented in Figure 3.1. It is assumed that the government organization is similar to that which would be established by the private sector as per the business venture description presented in Section 3. This organization will have a market orientation similar to that of the private sector. The organization will have complete responsibility for the space segment (including maintaining continuity of service), the ground processing segment and marketing and sales (including archiving).

It is likely that differences in organizational efficiency and management objectives will exist between government and private sector operations. These differences, if they exist, are difficult to quantify. No attempt was made as part of this study to quantify these differences. An important area where differences are likely to exist is in marketing and sales. Private sector market orientations differ significantly from that of the government. For example, the private sector

is used to providing incentives (commissions, bonuses, stock options, etc.) to encourage higher productivity from a marketing organization—the government is not. To achieve comparable performance, it is likely that a government organization would have to consider similar incentives to those available in the private sector.

The cost of continuing government ownership and operation of a land remote sensing system may be expressed as follows:

Fed. Gov't. Cost(I) = Space Segment Cost(I) + Ground Segment Cost(I) + R&D Cost(I) - Industrial Sales(I) - State/Local Gov't./Academic Sales(I) - Foreign Sales(I) - User Fees(I) + Interest on Debt(I) - Tax Revenue(I).

For the reasons previously discussed, the net effect of interest on debt and tax revenue is assumed small and not quantified. All of the other costs and revenue items are quantified and are established in Section 6.1.

5.3 Wholly Private Ownership and Operation by an Entity Competitively Selected

The private ownership and operation scenario is based upon providing continuous land remote sensing observation and resulting information products on a continuing basis. Commercialization is assumed to commence at the start of FY85 with all space, ground processing and marketing and sales being accomplished by or for the private sector organization. It is assumed that initially existing ground processing facilities at Goddard Space Flight Center, and archiving and processing facilities at EDC will continue to be utilized. These operations will be integrated into a common facilities at White Sands during FY89.

It is assumed that the private sector venture will utilize existing LANDSAT satellites and will, as indicated in Figure 3.1, phase into the acquisition and operation of other satellites. It is generally assumed in the financial analyses that the ground processing facilities at GSFC and EDC (until FY89) are leased by the private sector and that the LANDSAT D and D' satellites are acquired on a title transfer basis. The effect of lease payments and recoupment payments is investigated by considering the conditions of: a) full repayment (to the government) based upon estimated book value at the time of title transfer or lease rate establishment, and b) no recoupment by the government (i.e., a form of subsidy) for government assets utilized in the private sector operations.

The effect of and the need for annual cash subsidies is also considered. Annual subsidies are established (for both the full recoupment and no recoupment

cases discussed above) by determining the revenue required in order to achieve annual returns on capital that would be necessary to attract capital from the capital market. The difference between forecasted revenue and required revenue is then the required annual subsidy.

The general approach for analyzing the private ownership and operation scenario is illustrated in Figure 5.2. The financial analysis develops pro forma income statements, cash flow projections and balance sheets. The inputs to the analysis (described in detail in Section 6) are the demand or revenue forecast; the schedule of events; fixed and variable costs associated with processing, archiving and sales; capital items including value, timing and depreciation lives; tax structure data and other related information. Also specified are desired return on assets, desired discounted return on investment, debt equity structure, and the lease/transfer options. The result of the financial analysis is the determination of financial performance measures such as annual after-tax profit, annual cash flow, capital requirements, return on assets, payback period and subsidy requirements. The parameters are thus those of a business entity which is viable from the point of view of the financial community—i.e., it is likely that the necessary funding would be available.

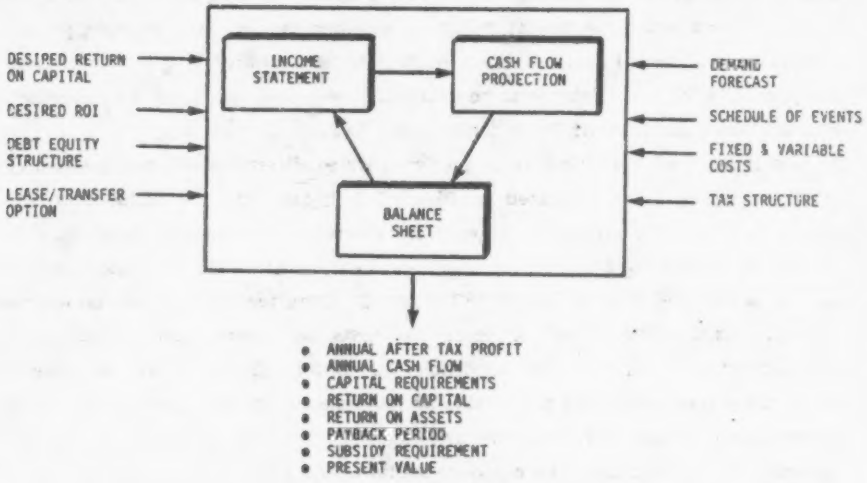


FIGURE 5.2 ANALYSIS OF PRIVATE OWNERSHIP AND OPERATION SCENARIO

As in the previous cases, government costs are also incurred. The annual government cost associated with the land remote sensing system may be expressed as follows:

Annual Fed. Gov't. Cost(I) = Gov't. Payment for Information Products(I) + Operations Costs(I) - Lease Payments(I) - Asset Recoupment Payments(I) - TDRSS Cost(I) + R&D Cost(I) - Profit Sharing or Royalty on Sales(I) + Subsidy Payments(I) + Interest on Debt(I) - Generated Tax Revenue(I).

Generated tax revenue consists, in this case, of two components—the first resulting from government expenditures in the private sector and the second resulting from the profitability of the commercial venture established for transfer of the remote sensing system. For the reasons previously discussed, the net effect of interest on debt and tax revenue (the first component) is assumed small and not quantified. All of the other costs and revenue items are presented in Section 6.2.

5.4 Phased Private Ownership (Government Ownership and Operation With Private Sector Marketing)

The phased private ownership scenario is based upon government ownership and operation of the space segment and the ground processing system, with the private sector venture concerned specifically with the marketing and sales of information products. This is basically the same as the government ownership and operation (continued ownership and operation) scenario as described in Section 5.2, with the exception that the marketing and sales operations are performed by the private sector. The interface is thus the provision of requested information products from the government to the marketing and sales organization. The marketing and sales organization will be granted an exclusive franchise to market and sell the information products to U.S. government agencies and nongovernment users. It would also market and sell to foreign users and would maintain the association with the foreign ground stations collecting the ground station fees.

For the provision of information products, the private venture makes payments to the government. It is assumed that these payments take the form of a royalty on sales with a minimum guaranteed annual payment made from the private sector to the government. The magnitude of this guarantee and the royalty percentage (competitively established) could serve as the basis for a competitively selected marketing and sales organization. The royalty payments would be made for information products having specified and agreed-to attributes. Guarantees

would have to be made by the government that these products would be available as agreed. Penalties would be imposed if the agreed-to information products were not provided.

From the private venture's point of view the guarantee level could be established such that the present value of net cash flow, including the guarantee payments, is equal to zero at a desired return on investment. This concept is illustrated in Figure 5.3.

This scenario has the apparent advantage of letting the private sector do what it knows best, i.e., marketing and sales. It requires the government to continue the ownership and operation of the remainder of the remote sensing system, in particular, those items necessitating large expenditures which the private sector may not be willing to make in any event without large subsidies.

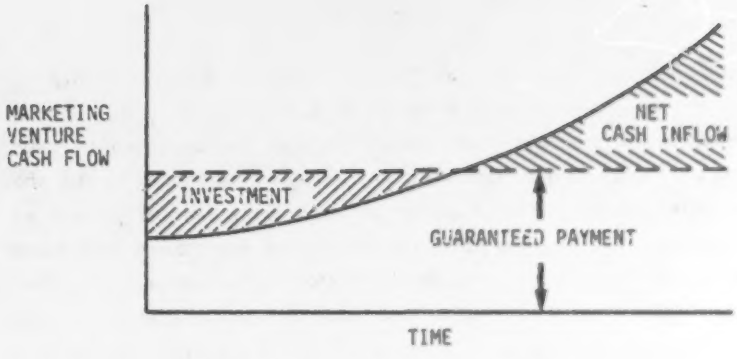
The annual government cost associated with the land remote sensing system may be expressed as follows:

Annual Fed. Gov't. Cost(I) = Gov't. Payments for Information Products(I) + Operations Costs(I) + R&D Cost(I) - Profit Sharing or Royalty on Sales(I) - Guaranteed Payments(I) + Interest on Debt(I) - Generated Tax Revenue(I).

As discussed in Section 5.3, the general tax revenue consists of two components. The first resulting from government expenditures in the private sector, and the second resulting from the profitability of the commercial venture. For the reasons previously discussed, the net effect of interest on debt and tax revenue (the first component) is assumed small and not quantified. All of the other cost and revenue items are quantified and are indicated in Section 6.3.

5.5 Legislatively-Chartered, Privately-Owned Corporation

From the financial analysis point of view the legislatively-chartered, privately-owned corporation is similar to the private ownership scenario discussed in Section 5.3. The major difference is concerned with the equity structure of the corporation. It is assumed that the federal government purchases equity in the corporation. This is in effect a form of subsidy. Altering the debt equity structure affects interest rates and the overall cost of capital. These effects are taken into account in the financial analysis and the results presented in Section 6.4.



GUARANTEED PAYMENT SUCH THAT:

PV OF INVESTMENT = PV OF NET CASH INFLOW AT REQUIRED ROI

FIGURE 5.3 SCENARIO 4: PHASED PRIVATE OWNERSHIP (GOVERNMENT OWNERSHIP & OPERATION/PRIVATE SECTOR MARKETING)

As in the previous cases, government costs are also included. The annual government cost associated with the land remote sensing system may be expressed as follows:

Annual Fed. Gov't. Cost(I) = Gov't. Payment for Information Products(I) + Operations Costs(I) - Lease Payments(I) - Asset Recoupment Payments(I) - TDRSS Cost(I) + R&D Cost(I) - Profit Sharing or Royalty on Sales(I) + Interest on Debt(I) - Generated Tax Revenue(I) + Subsidy Payments(I) + Equity Purchase(I) - Dividends(I).

All of the cost and revenue items are quantified and are indicated in Section 6.4.

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6. FINANCIAL ISSUES

As stated previously, we have taken the position that in order to evaluate the approaches for commercialization or retention it is necessary to plan potential business ventures and evaluate their financial merit, the likelihood of their financing and their impact on government cash flows. We have tried to play the role of an entrepreneur, putting together business plans for the purpose of obtaining financing. The business plans are based upon a perceived technology base, a market forecast, cost and capital expenditure estimates, and a specific business system. The market forecast is based upon a review of previous market studies and discussions with the user community. The cost and capital expenditure estimates were, in most cases, based upon estimated historical costs. No attempt was made to verify the accuracy of these cost data nor was an attempt made to address the issue of government overhead rates. With respect to the business scenario, from the large array of possibilities a particular scenario (as described in Section 3) was selected and used as the basis for planning and evaluating each of the approaches for commercialization or retention. This allows all of the approaches for commercialization or retention to be evaluated on a common basis and compared.

The analysis process followed is summarized in Figure 6.1. The first step was the formulation of the overall business plan which encompassed considerations of products, schedules, technology availability and nonfinancial issues. Ground segment costs and space segment costs were estimated. Ground segment costs were developed for processing, archiving and communications--both fixed and variable costs were developed. Space segment costs considered both nonrecurring and recurring costs and the phasing in of different sensors over time. The SATIL probabilistic life cycle costing model (see Appendix A) was used to verify estimates of the quantity of satellites required.

Demand and revenue forecasts were made in terms of information product type and market segment. A pricing policy was postulated and together with price elasticity estimates (by market segment and product type) were used in a Market Model to establish demand and revenue forecasts. The revenue forecasts together with the ground and space segment costs were used in the financial analysis (a financial analysis model was specifically developed for this purpose) to develop pro

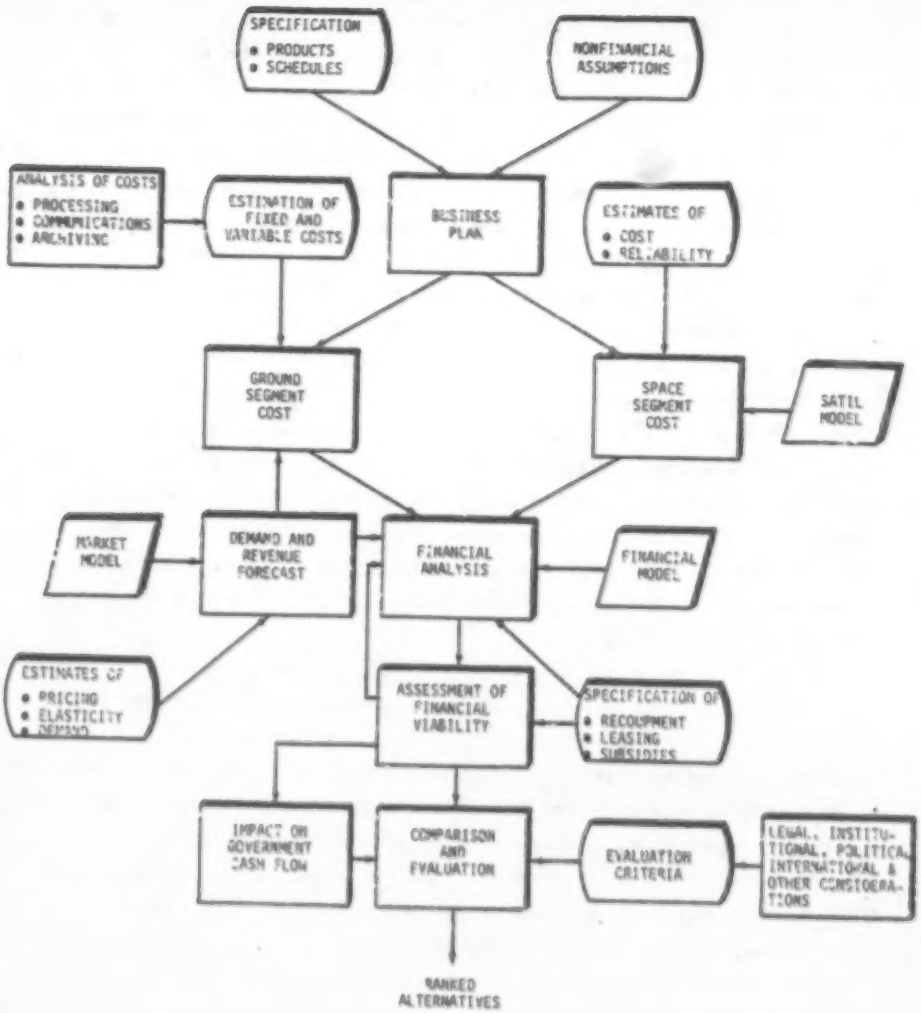

FIGURE 6.1 THE ANALYSIS PROCESS

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forma income statements, cash flow projections and balance sheets for the commercial organizations. These financial analyses were iterated upon in order to establish the need for and the magnitude of government subsidies that would result in a viable business venture. Viability implies that the financial performance measures such as return on capital, return on assets and net present value are of sufficient magnitude to attract financing in the capital markets. The necessary financial performance measures were established by individuals with backgrounds in financing of large capital-intensive ventures. As a part of this effort alternative recoupment and leasing scenarios were considered.

Once a financially viable solution for each of the commercialization or retention scenarios was developed, the impact on government cash flow was determined. Nonfinancial issues together with the impact on government cash flows were considered in a comparison and ranking of the considered alternatives.

In the following paragraphs the results of the financial analyses, are presented and discussed. Detailed backup for the financial analyses (primarily with respect to the input data used in the analyses) is presented in Appendix B. Prior to presenting the results of the analyses, a brief discussion is presented with respect to the relationship and significance of the financial documentation and the criteria used for assessing financial viability.

6.1 Financial Projections for a Civil Land Remote Sensing System

The purpose of preparing financial projections is to provide the reader with information for making rational economic decisions with regard to five financial and organizational alternatives. Typically, financial statements are prepared to satisfy the needs of various user groups such as potential stockholders, creditors, government agencies, etc. Financial data provided to such user groups usually contains a Balance Sheet, Statement of Income and Statement of Changes in Financial Position. Additional information such as projected cash flows, return on equity, return on assets, debt to capitalization ratios and net present value of cash flows are provided as additional measurements used by the financial community to evaluate an enterprise. It should be emphasized that no single factor determines whether an enterprise is attractive or unattractive as an investment opportunity.

Contained in this section of the report are five separate sets of financial projections. These projections reflect the following financial and organizational approaches for commercialization or retention of the civil operational land remote sensing system:

1. Government ownership and operation (planned phase-out)
2. Government ownership and operation (continued ownership and operation)
3. Private ownership and operation
4. Phased private ownership (government ownership and operation with private sector marketing)
5. Legislatively-chartered, privately-owned corporation (government equity position).

As a separate and distinct land remote sensing enterprise does not currently exist, some historical data was not available as a basis for the projections. Therefore portions of the data used as a basis for the financial projections were estimated based upon the best information available at this time. The projections reflect, in our judgment, the single most probable result for each scenario projected. Each financial projection contains up to six parts as follows:

1. Data Set (applies with slight modifications to all scenarios)
2. Projected Statement of Income
3. Projected Balance Sheet
4. Projected Statement of Changes in Financial Position
5. Projected Cash Flow
6. Projected U.S. Government Cash Flows.

Part 1 - "Data Set" (Refer to Financial Exhibit 6.0)

In preparing a financial projection, as in preparing comparative projections, it is necessary to develop key basic assumptions upon which the projections are prepared. Although each scenario reflects alternative operating and capital assumptions, the basic assumptions with regard to costs and revenue are consistent in order to provide for an effective comparison. Supporting data to quantities used in the data set are contained in Appendix B of this report.

Direct costs reflected in the data set are semi-variable and variable costs attributed to processing, archiving and sales of remotely sensed data on a per scene basis. A learning factor and a processing to scenes factor is also applied. Although certain noncapital operating costs at EDC, Goddard and White Sands facilities are semi-variable, all costs have been treated as variable for purposes of this projection.

R&D and marketing costs are reflected in the data set as both a fixed minimum cost/year, as well as a percentage of revenue. This results in a semi-variable cost treatment dependent upon the projected revenue level. Communication costs for both TDRSS and DOMSAT have been treated as variable costs although certain costs are fixed. Variable and nonvariable ground facilities and equipment are assumed to be leased from the U.S. government through 1988 with alternative facilities and equipment leased from third parties after 1988. Fixed assets with the exception of LANDSAT D and D' have been depreciated on a four year straight line basis with full year depreciation taken in the year placed in service. LANDSAT D and D' are depreciated on a straight line basis over their remaining useful lives (one year and 3 years respectively).

Construction payment schedules for satellites generally assume a three to five year construction period with 12 percent of the total payment due four years before the satellite is delivered, 16 percent due three years before, 24 percent due two years before, 16 percent due one year before, and 32 percent due at launch. Construction payments include storage and cost of launch and are capitalized in the year incurred.

Cash requirements for Balance Sheet operating purpose are predicated upon an assumed number of days in terms of revenue for operating cash, accounts receivable and accounts payable. A fixed amount of contributed capital is reflected over the entire ten year projection with a cost of borrowing at an estimated 11 percent long-term borrowing rate.

Investment tax credits are taken on space segment assets during construction. It is assumed that 60 percent of annual R&D expenditures qualify for the R&D tax credit (a 60% x 25% R&D tax credit = 15% net credit). Royalties paid to the U.S. government are based upon a percentage of data sales with a minimum base royalty.

Part 2 - "Projected Statement of Income"

The Projected Statement of Income provides for the results of operations for the profit seeking alternative scenarios during a ten year period. The Income Statement and the derived cash flow may be considered to be the most important statement for purposes of evaluating the worth of the enterprise from the standpoint of investment value. Although a clear cut definition of an income statement is seldom found, one may simplistically describe it as a presentation of

revenue and cost predicated upon consistent accounting assumptions. The difference between revenues and costs derive net income which is used as a measure as to the financial success of the enterprise. A typical (simplified) profit and cash flow computation procedure is illustrated in Figure 6.2.

The Projected Statements of Income contained in this report were prepared consistent with the key assumptions reflected and described in the data set and Appendix B.

The before tax profit on operations is determined by subtracting the projected costs and expenses from the projected revenues. Federal taxes are deducted from the before tax profit at a rate of 51 percent. If the before tax profit is negative (a loss) the federal tax loss carry forward is treated as a benefit in the current year, reducing the reported loss. Current year investment and R&D tax credits are treated in the same manner. As this is not a cash inflow, adjustments are reflected on the cash flow statement.

Part 3 - "Projected Balance Sheet"

The Projected Balance Sheets presented depict the value of the various enterprises on the basis of projected revenues, costs, borrowings and contributed capital. Although the significance of a Projected Balance Sheet is not as important as a Projected Income Statement for making investment decisions, it is a valuable supplement to the information contained in the Statement of Income. More specifically, the Balance Sheet depicts the value of the enterprise in terms of assets, at cost, its liabilities and the equity of the shareholders at a given point in time.

Part 4 - "Projected Statement of Changes in Financial Position"

The Projected Statement of Changes in Working Capital reflects changes in the working capital of the enterprise from operating year to operating year. Working capital may be defined as current assets less current liabilities. The purpose of this statement is to provide an explanation of what provided working capital during each year and how working capital was applied during each year. In other words, the statement depicts whether or not sufficient working capital is provided by operations; if not, it indicates which sources are being utilized to provide working capital for continued operation of the enterprise.

Part 5 - "Projected Cash Flow"

This statement a) reflects sources of cash (net income, increases in current liabilities, etc.), b) applications of cash (losses, increases in fixed assets, accounts

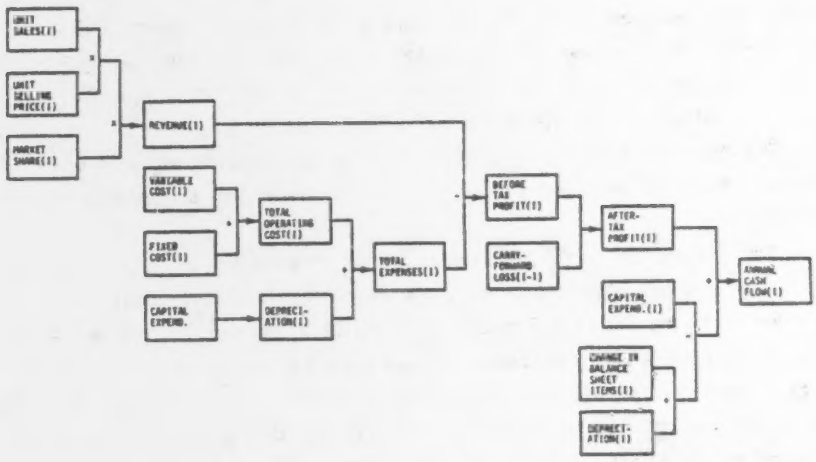

FIGURE 6.2 SIMPLIFIED PROFIT AND CASH FLOW COMPUTATIONAL PROCEDURE

receivable, etc.) The difference between the sources and applications is the net annual cash flow of the enterprise.

This statement is similar in nature to the Projected Statement of Changes in Financial Position except that operating funds are analyzed in terms of increases or decreases to cash from operations of the enterprise. Nonoperating sources of cash such as contributed capital and borrowed capital are not included. Nonoperating applications of cash such as dividend distributions are also excluded.

This statement also reflects adjustments for the noncash nature of the tax credits and loss carry forwards obtained in the early years of the venture. Although these credits were reflected on the Income Statement, Balance Sheet and Statement of Changes in Financial Position as credits in the year they were earned, no cash was actually received—credits would actually be carried forward and offset against future tax liabilities.

The cash flow stream is discounted at various rates and the present value of the venture is determined by summing the discounted values. Present value "A" is the sum of the discounted cash flows for the years 1985-1994. Present value "B" is the sum of the discounted cash flows from 1995 to infinity, assuming that the annual cash flow in each of those years is the same as it is projected to be in 1994.

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Three key financial ratios of the venture are also shown. The return on capitalization is maintained at a value of 17 percent by adjustments to the "additional federal purchases" line. Capital market experts have indicated that a "utility" of this type should have the capability of maintaining at least this rate of return.

Part 6 - "Projected U.S. Government Cash Flows"

The cash flow described in the preceding section is that experienced by a commercial venture. Each of the five scenarios will result in a government cash flow impact. Dependent upon which scenario is examined the nature of the government cash flow will contain a subset of the following:

Cash outflows:

- Expenditures for information products, i.e., purchases of tapes and films
- Possible purchases of spacecraft and ground-based facilities
- Costs for operations such as spacecraft launches that exceed the actual reimbursement made to the federal government by the LANDSAT commercial venture
- Continuing government-funded research and development related to LANDSAT (assumed to be $10 million per year)
- Direct equity contributions from the U.S. government to the LANDSAT venture
- Any direct subsidy (also referred to as "additional federal purchases")

Cash inflows:

- Payments for leases of government facilities
- Any nongovernment data sales and ground station fees
- "Asset recoupment" means any initial payment made by the new venture when it takes over the existing LANDSAT assets
- Any royalty fees that may be paid by the venture to the government
- Tax revenues paid by the LANDSAT venture if it eventually becomes profitable and exhausts its tax loss carry forward credits
- Any dividends paid to the government if the government has become a stockholder.

6.1.1 Government Ownership and Operation (Planned Phase-Out) (Refer to Financial Exhibit 6.1)

Under this scenario revenues and associated costs are reflected through 1988 at which time LANDSAT D' ceases operation. No operating revenue is recognized beyond that time and all future costs of operating the land remote sensing system

are terminated. Federal purchases of remotely sensed data are assumed to be purchases from a third party at a cost consistent with amounts contained in the data set. As no private sector investment is reflected in this scenario, only government cash flows are projected.

Costs and revenues generated through termination are consistent with amounts reflected in the data set with the exception of ground station fees and government R&D expenditures. These amounts have been reduced as the program approaches the projected termination date.

6.1.2 Government Ownership and Operation (Continued Ownership and Operation) (Refer to Financial Exhibit 6.2)

This projection reflects a continued operation of the land remote sensing system by the U.S. government. Revenues and costs are consistent with those reflected in the data set. Assets, as well as other costs, have been treated on a cash basis. A $10 million/year R&D expenditure has been included as an assumed commitment by the government over the ten year period being projected.

Revenues by the government reflect nongovernment data sales and ground station fees consistent with amounts assumed in the data set. Interagency transfer payments for data sold are not included in government receipts.

As this financial projection does not assume private sector operations, the Projected Statement of Income, Balance Sheets, Statement of Changes in Financial Position and private sector Projected Cash Flows, have not been included.

6.1.3 Private Ownership and Operation (Refer to Financial Exhibits 6.3.1 through 6.3.5)

This financial projection assumes a divestiture of the land remote sensing system to a private sector enterprise. It is assumed that LANDSAT D and D' are purchased from the government by a private enterprise and that existing ground facilities are leased from the government for a four year period. All costs of operations are borne by the private entity. It is also assumed that costs of archiving are borne by the private sector. As the entity cannot derive a satisfactory rate of return on equity without federal assistance, "additional federal purchases" have been projected to derive a 17 percent return on equity to the private investor.

The financial statements are derived from base revenues and cost assumptions contained in the data set. Tax benefits and costs are reflected on a current year basis. Although the space segment assets qualify as five year ACRS property

for depreciation for tax purposes, asset lives of four years were used in the financial projections. Such timing differences have not been reflected in the benefit calculations and are not considered to have a material effect.

Variables are reflected in the long-term debt and cumulative dividends amounts contained in the Projected Balance Sheets. Excess cash "thrown off" by the venture, in excess of assumed long-term debt of $100 million, are treated as distribution of dividends.

The Projected Cash Flow provides for a discounted rate of return of approximately 12 percent with a return on equity of 17 percent. Return on assets and debt to capitalization ratios are also provided.

6.1.4 Phased Private Ownership (Private Sector Marketing) (Refer to Financial Exhibits 6.4.1 through 6.4.5)

The financial projections for phased private ownership reflect a separate marketing organization established with exclusive rights for sales of U.S.-produced land remote sensed data produced by the LANDSAT venture. Initially (first ten years) all costs of operation would be borne by the U.S. government. In return for such rights, the private sector would pay a minimum royalty fee of 80 percent of all data sold and ground station fees with a minimum annual royalty payment (guaranteed) of $33.5 million. Cash generated by the venture in excess of operating requirements are first used to reduce long-term debt and next used to provide dividends to the private investor. A rate of return based upon present value of cash flows for the first ten years is calculated at 12 percent to 13 percent. Other ratios such as return on assets, return on equity and debt to capitalization are calculated based upon the present value of cash flow assumption of 12 percent to 13 percent over the first ten years. Government cash flows reflect the costs of continued operation reduced by royalty fees collected and tax revenues received from the private sector enterprise.

6.1.5 Legislatively-Chartered, Privately-Owned Corporation (Refer to Financial Exhibits 6.5.1 through 6.5.5)

The financial projection for this organizational scenario closely reflects private ownership (Section 6.1.3) with the addition of an equity participation by the U.S. government. The government would provide initial equity capital which was assumed to be a 33 percent participation. Dividend distributions from the enterprise provided in later years would be paid to the government based upon its equity participation. No provision has been made in the projection for the government liquidating its equity position in the venture at any time.

6.1.6 Comparison of Financial Projections

In comparing projected operating results of the five financial and organizational scenarios, it is appropriate to evaluate such alternatives from both a public and private sector viewpoint. It appears that the existing civil remote sensing system is not a viable commercial enterprise without either a significant guaranteed subsidy by the U.S. government or a material reduction in the projected costs of operation. Government costs for the continuation of the existing land remote sensing system range from an average annual cost of $68 million (constant FY83$) per year for government operation to $82 million (constant FY83$) per year under a private ownership alternative (Figure 6.3). If the private sector alternative is chosen, a minor reduction in cost to government may be achieved through transfer of existing LANDSAT program assets to the private sector without recoupment by the government (Figure 6.4). Assuming continuation of the system is desired, continued government operation reflects the lowest projected cost. The primary reason for continued government operation be the most cost effective alternative is that return on capital costs are not considered in the evaluation of government costs of operation. To attract private sector investment in an enterprise, a reasonable rate of return must be achieved. In order for a private sector alternative to provide a lower cost to the government (subsidy), cost and/or revenue efficiencies by the private sector would have to improve significantly to offset required return on capital.

The financial analysis in this report is predicated upon a consistent set of data with regard to revenues and costs for both private sector operation as well as continued operation by the government. A specific level of service was assumed. It should be noted that system configurations which provided other levels of service were not analyzed. It is possible that such systems may provide a lower cost to the government but would result in reduced services and benefits.

LAND REMOTE SENSING SYSTEM FISCAL YEARS 1985-1994 COMPARATIVE ANALYSIS OF NET GOVERNMENT EXPENDITURES				AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS, at INFLATION RATE ASSUMED	
FISCAL YEAR	GOVERNMENT OWNERSHIP AND OPERATION (PLANNED PHASE-OUT)	GOVERNMENT OWNERSHIP AND OPERATION (CONT'D OWNERSHIP & OPERATION)	PRIVATE OWNERSHIP AND OPERATION	PHASED PRIVATE SECTOR OWNERSHIP (PRIVATE SECTOR MKTS.)	LEGISLATIVELY CHARTERED, PRIVATELY OWNED CORPORATION
1985	58,935	96,855	-130,866	90,081	-106,108
1986	15,544	112,346	132,396	111,704	132,396
1987	16,076	156,846	170,422	160,141	170,422
1988	14,120	69,456	115,802	74,906	115,802
1989	14,300	97,104	137,365	103,584	137,365
1990	14,340	108,921	173,685	114,216	173,685
1991	17,850	131,510	177,438	137,412	177,438
1992	20,980	50,471	187,498	57,103	187,498
1993	24,310	73,726	167,006	80,904	129,675
1994	27,340	61,318	146,543	59,165	127,672
NET PRESENT VALUE @ 10%: YEARS 1-10	144,917	610,037	686,777	628,763	686,170
YEAR 11 AND AFTER	95,825	179,866	513,623	207,369	447,481
TOTAL NET PRESENT VALUE	240,742	789,903	1,200,400	836,132	1,133,651

FIGURE 6.3 COMPARISON OF NET GOVERNMENT EXPENDITURES

LAND REMOTE SENSING SYSTEM
FISCAL YEARS 1985-1994
COMPARATIVE ANALYSIS
ASSET RECOUPMENT BY THE U.S. GOVERNMENT VS.
NONRECOUPMENT BY THE U.S. GOVERNMENT*

AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS; 6% INFLATION RATE ASSUMED

FISCAL YEAR	RECOUPMENT OF ASSETS BY U.S. GOVERNMENT				NONRECOUPMENT OF ASSETS BY U.S. GOVERNMENT			
	PRIVATE OWNERSHIP & OPERATION		LEGISLATIVELY CHARTERED, PRIVATELY OWNED CORPORATION		PRIVATE OWNERSHIP & OPERATION		LEGISLATIVELY CHARTERED, PRIVATELY OWNED CORPORATION	
	NET GOV'T. EXPENDITURES	ADDITIONAL FED. PURCHASES	NET GOV'T. EXPENDITURES	ADDITIONAL FED. PURCHASES	NET GOV'T. EXPENDITURES	ADDITIONAL FED. PURCHASES	NET GOV'T. EXPENDITURES	ADDITIONAL FED. PURCHASES
1985	-130,855	160,000	-106,105	160,000	49,961	37,500	74,711	37,500
1986	132,396	142,500	132,396	142,500	48,796	35,000	48,796	35,000
1987	170,422	180,000	170,422	180,000	94,322	80,000	94,322	80,000
1988	115,802	125,000	115,802	125,000	95,124	97,500	96,124	97,500
1989	137,365	120,000	137,365	120,000	121,783	120,000	121,783	120,000
1990	173,685	155,000	173,685	155,000	153,524	155,000	153,524	155,000
1991	177,438	180,000	177,438	180,000	176,821	180,000	176,821	180,000
1992	187,498	215,000	187,498	215,000	186,848	215,000	186,848	215,000
1993	167,005	175,000	129,675	175,000	163,869	170,000	122,895	170,000
1994	146,543	155,000	127,672	155,000	144,093	150,000	126,030	150,000
NET PRESENT VALUE @ 10% YEARS 1-10	686,777	972,484	686,170	972,484	687,497	674,315	684,712	674,315
YEAR 11 & AFTER	513,623	543,266	447,481	543,266	505,036	525,741	441,727	525,741
TOTAL NET PRESENT VALUE	1,200,400	1,515,750	1,133,651	1,515,750	1,192,533	1,200,056	1,126,439	1,200,056

*RECOUPMENT OF ASSETS DEFINED AS PAYMENT BY ENTERPRISE TO U.S. GOVERNMENT FOR LANDSAT D & D', AND LEASE PAYMENTS FOR USE OF GSFC FACILITIES.

FIGURE 6.4 COMPARISON OF ASSET RECOUPMENT BY THE U.S. GOVERNMENT VS. NONRECOUPMENT BY THE U.S. GOVERNMENT

LAND REMOTE SENSING SYSTEM
FISCAL YEARS 1985-1994
FINANCIAL PROJECTIONS
DATA SET
BAU

AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS; 6% INFLATION RATE ASSUMED
UNITS EXPRESSED IN THOUSANDS
AMOUNTS PER SCENE EXPRESSED IN WHOLE DOLLAR AMOUNTS

REVENUE/COST ELEMENT	FISCAL YEARS 1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
REVENUE:										
UNITS SOLD										
30 METER---FILM	42.79 (1)*	40.72	37.14	34.48	32.00	31.10	28.63	27.94	27.94	27.94
TAPE	11.45 (1)	10.25	9.22	10.68	10.18	9.81	9.26	8.61	7.91	7.91
30 METER---FILM	16.50 (1)	24.11	25.24	21.62	19.41	13.66	18.88	23.42	25.70	27.17
TAPE	2.35 (1)	3.50	3.79	3.32	2.97	2.07	3.02	3.66	3.92	4.07
SALES FEDERAL ----80M	6540 (1)	7180	8010	8750	9570	10220	11240	11940	12660	13420
NON-FEDERAL 80M	3490 (1)	3100	3220	4950	5180	5670	6280	5460	4040	4670
FEDERAL----30M	3460 (1)	5050	6740	5330	4720	4020	6610	9040	11650	13910
NON-FEDERAL 30M	4500 (1)	6660	8040	7900	7780	5340	8910	12130	12210	14240
STATION FOREIGN STATION	692 (1)	712	755	800	848	899	953	1010	1071	1135
NO. OF FOREIGN STATIONS	13 (1)	14	15	15	15	15	15	15	15	15
OTHER REVENUE	0	0	0	0	0	0	0	0	0	0
ADDITIONAL FEDERAL PURCHASES	160000 (2)	142500	180000	125000	120000	155000	180000	215000	175000	155000
DIRECT COSTS:										
PROCESSING COST/SCENE-80M	270.30 (3)	286.50	303.70	321.90	341.20	361.70	383.30	406.30	430.70	456.60
30M	495.86 (4)	525.55	557.08	590.51	625.94	663.49	703.30	745.50	790.23	837.64
PROCESSING LEARNING FACTOR	1.00 (5)	0.90	0.85	0.81	0.78	0.76	0.74	0.73	0.72	0.70
PROCESSING/SALES FACTOR	0.52 (6)	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
ARCHIVAL COST/SCENE 80M	49.70 (7)	52.70	55.80	59.20	62.70	66.50	70.50	74.70	79.20	83.90
30M	121.80 (8)	129.10	136.90	145.00	153.80	163.00	172.70	183.10	194.10	205.70
ARCHIVAL LEARNING FACTOR	1.00 (9)	0.90	0.85	0.81	0.78	0.76	0.74	0.73	0.72	0.70
COST OF SALES/UNIT 80M-FILM	30.50 (10)	32.10	34.00	36.20	40.50	43.00	45.50	48.20	48.70	51.10
TAPE	182.60 (10)	193.60	205.20	217.50	230.50	244.30	259.00	274.50	291.00	308.40
30M-FILM	55.16 (10)	56.30	59.70	63.20	67.00	71.00	75.30	77.80	84.60	87.70
TAPE	319.64 (10)	338.80	359.10	380.60	403.50	427.70	453.30	480.50	509.30	539.90
C OF S LEARNING FACTOR	1.00 (11)	0.90	0.85	0.81	0.76	0.76	0.74	0.73	0.72	0.70
INDIRECT LABOR	5097 (12)	5310	5628	5966	6324	6705	7105	7572	7984	8463
R&D-EXPENSED IN DOLLARS	900 (13)	950	1010	1070	1135	1200	1275	1359	1436	1520
-EXPENSED AS % OF REV	0.04 (13)	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
MRKTING,ADV,DISTRIBUTION										
EXPENSED IN DOLLARS	1425 (14)	1510	1600	1700	1800	1900	2025	2150	2275	2405
EXPENSED AS % OF REV	0.05 (14)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
CONSTRUCTIONS COSTS:										
TORS COST/SCENE 80M	62.50 (15)	66.30	70.20	74.40	78.90	83.60	88.60	93.90	99.60	105.50
30M	354.20 (15)	375.50	398.00	421.80	447.20	474.00	502.40	532.50	564.50	598.40
DOMSAT COST/SCENE 80M	10.40 (16)	11.00	11.70	12.40	0.00	0.00	0.00	0.00	0.00	0.00
30M	6.70 (16)	7.10	7.55	7.98	8.46	8.97	9.50	10.07	10.68	11.32
TDRSS LEASE COSTS(ANNUAL)	0.00 (17)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DOMSAT LEASE COSTS(ANNUAL)	0.00 (18)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEASE COSTS:										
LANDSAT 6	0 (19)	0	0	0	0	0	0	0	0	0
LANDSAT 7	0 (19)	0	0	0	0	0	0	0	0	0
GROUND FACILITIES-GSFC	23900 (20)	23900	23900	23900	0	0	0	0	0	0
EDC	2200 (20)	2200	2200	2200	0	0	0	0	0	0
W. SANGS	0 (20)	0	0	0	0	0	0	0	0	0
NON-GOVT	0 (20)	0	0	0	23120	23120	23120	23120	23120	23120

FINANCIAL EXHIBIT 6.0 DATA SET

*THE NUMBER IN PARENTHESIS REFER TO SECTIONS IN APPENDIX B WHEREIN SUPPORTING DOCUMENTATION WILL BE FOUND.

ASSETS:											
GROUND SEGMENT:											
GROUND STATION	0 (21)	0	0	0	0	0	0	0	0	0	0
PROCESSING FACILITIES	0 (21)	0	0	0	0	0	0	0	0	0	0
ADDITIONAL FACILITIES	0 (21)	0	0	0	0	0	0	0	0	0	0
CUMULATIVE GROUND SEGMENT	0 (21)	0	0	0	0	0	0	0	0	0	0
SPACE SEGMENT:											
LANDSAT D 71700 (23)	71700										
LANDSAT D' 240000 (23)	240000	0	0	0	0	0	0	0	0	0	0
LANDSAT E 172000 (23)	75800	65360	80840	0	0	0	0	0	0	0	0
LANDSAT E' 101000 (23)	12120	29290	17170	0	0	42420	0	0	0	0	0
LANDSAT F 241000 (23)	0	0	28920	38560	57840	38560	77120	0	0	0	0
LANDSAT F' 149000 (23)	0	0	14900	19370	29800	19370	14900	0	0	0	0
LANDSAT G & G' 275000 (23)	0	0	0	0	0	0	33000	44000	44000	44000	
CUMULATIVE SPACE SEGMENT	357620	452270	594100	652030	739670	840020	965040	1009040	1075040	1119040	
DEPRECIATION LIFE(STRAIGHT LINE)											
GROUND STATIONS/FACILITIES	4YRS										
LANDSAT D	1YRS										
LANDSAT D'	3YRS										
LANDSAT E	4YRS										
LANDSAT E'	4YRS										
LANDSAT F	4YRS										
LANDSAT F'	4YRS										
LANDSAT G & G'	4YRS										
CONSTRUCTION IN PROGRESS:											
% OF COMPLETION/YEAR											
LANDSAT D'	1.00										
LANDSAT E	0.15	0.38	0.47								
LANDSAT E'	0.12	0.29	0.17	0.00	0.00	0.42					
LANDSAT F			0.12	0.16	0.24	0.16	0.32				
LANDSAT F'			0.10	0.13	0.20	0.13	0.10				
LANDSAT G & G'							0.12	0.16	0.24	0.16	
DEPRECIATION EXPENSE											
GROUND STATION	0	0	0	0	0	0	0	0	0	0	
PROCESSING FACILITIES	0	0	0	0	0	0	0	0	0	0	
ADDITIONAL FACIL & EQUIP	0	0	0	0	0	0	0	0	0	0	
LANDSAT D	71700	0	0	0	0	0	0	0	0	0	
LANDSAT D'	78533	78533	78533	0	0	0	0	0	0	0	
LANDSAT E	0	0	40850	40850	40850	40850	0	0	0	0	
LANDSAT E'	0	0	0	0	0	23988	23988	23988	23988	0	
LANDSAT F	0	0	0	0	0	0	57238	57238	57238	57238	
LANDSAT F'	0	0	0	0	0	0	0	0	0	0	
LANDSAT G & G'	0	0	0	0	0	0	0	0	0	0	
CUMULATIVE DEPRECIATION	150233	228767	348150	389000	429850	494687	575912	657137	738362	795600	
CASH REQ IN DAYS	15 (24)	15	15	15	15	15	15	15	15	15	
A/R REQ IN DAYS	60 (25)	60	60	60	60	60	60	60	60	60	
CP REQ IN DAYS	30 (26)	30	30	30	30	30	30	30	30	30	
DAYS IN YEAR	365	365	365	365	365	365	365	365	365	365	
CONTRIBUTED CAPITAL	75000 (27)	75000	75000	75000	75000	75000	75000	75000	75000	75000	
COST OF BORROWING 0.11	0.11 (28)	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	
FEDERAL AND STATE TAX RATE	0.51 (29)	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	
INVESTMENT TAX CREDIT BASE	357620 (30)	94650	141850	57930	87640	100150	125020	44000	66000	44000	
INVESTMENT TAX CREDIT RATE	0.10 (31)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	
EQUITY PARTICIPATION BY USA	0.33 (32)	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	
NET TAX CREDIT RATE	0.15 (33)	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	
OTHER EXPENSES											
MAINTENANCE-BASE FEE	32560 (34)	0	0	0	0	0	0	0	0	0	
MAINTENANCE AS A % OF BASE	0.00 (35)	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	
U.S. GOVERNMENT END EXPENDIT	10000 (36)	10000	10000	10000	10000	10000	10000	10000	10000	10000	

FINANCIAL EXHIBIT 6.0 DATA SET (CONTINUED)

SCENARIO # 1
GOVERNMENT OWNERSHIP AND OPERATION
(PLANNED PHASE OUT)

LAND MOBILE SERVICES SYSTEM
FISCAL YEARS 1985-1994
FINANCIAL PROJECTIONS
PROJECTED U.S. GOVERNMENT CASH FLOWS

AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS; 6% INFLATION RATE ASSUMED

	FISCAL YEARS									
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
U.S. GOVERNMENT EXPENDITURES:										
INFORMATION PRODUCTS	0	0	0	14120	14300	14340	17850	20980	24310	27340
ASSET PURCHASES	40000	0	0	0	0	0	0	0	0	0
OPERATIONS COSTS (NET OF RE-IMBURSEMENTS	25461	27424	27601	0	0	0	0	0	0	0
R&D COSTS	10000	5000	2000	0	0	0	0	0	0	0
EQUITY CONTRIBUTION	0	0	0	0	0	0	0	0	0	0
SUBSIDY	0	0	0	0	0	0	0	0	0	0
TOTAL US GOV'T EXPENDITURES	75461	32424	29601	14120	14300	14340	17850	20980	24310	27340
U.S. GOVERNMENT RECEIPTS:										
RECEIPTS FROM LEASEHOLD FAC)	0	0	0	0	0	0	0	0	0	0
NON-GOVERNMENT DATA SALES AND GROUND STATION FEES	16526	16880	13525	0	0	0	0	0	0	0
ASSET ACCOUNT	0	0	0	0	0	0	0	0	0	0
TOKEN LEASE FEES	0	0	0	0	0	0	0	0	0	0
ROYALTY FEES	0	0	0	0	0	0	0	0	0	0
TAX REVENUE	0	0	0	0	0	0	0	0	0	0
DIVIDENDS RECEIVED	0	0	0	0	0	0	0	0	0	0
TOTAL US GOV'T RECEIPTS	16526	16880	13525	0	0	0	0	0	0	0
NET US GOV'T EXPENDITURES	58935	15544	16076	14120	14300	14340	17850	20980	24310	27340

DISCOUNT RATE	PRESENT VALUE "A"	PRESENT VALUE "B"	TOTAL PRESENT VALUE
0.10	144917	95825	240742
0.15	122191	59177	181368
0.20	105557	38398	143953
0.25	93017	9394	102411
0.30	83308	5085	88393

PRESENT VALUE OF "A" IS THE PRESENT VALUE OF THE CASH FLOWS, YEAR 1 THROUGH 10
PRESENT VALUE OF "B" IS THE PRESENT VALUE OF THE CASH FLOWS, YEAR 11 AND AFTER

FINANCIAL EXHIBIT 6.1 GOVERNMENT OWNERSHIP AND OPERATION (PLANNED PHASE-OUT)

SCENARIO # 2
GOVERNMENT OWNERSHIP AND OPERATION
(CONTINUED OWNERSHIP AND OPERATION)

LAND REMOTE SENSING SYSTEM
FISCAL YEARS 1985-1994
FINANCIAL PROJECTIONS
PROJECTED U.S. GOVERNMENT CASH FLOWS

AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS; 6% INFLATION RATE ASSUMED

FISCAL YEARS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
U.S. GOVERNMENT EXPENDITURES:										
INFORMATION PRODUCTS	0	0	0	0	0	0	0	0	0	0
ASSET PURCHASES	77920	94650	141830	57930	87640	100350	125020	44000	66000	44000
OPERATIONS COSTS (NET OF REIMBURSEMENTS	25461	27424	27601	26756	25144	23026	23978	29191	31541	33513
R&D COSTS	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
EQUITY CONTRIBUTION	0	0	0	0	0	0	0	0	0	0
SUBSIDY	0	0	0	0	0	0	0	0	0	0
TOTAL US GOV'T EXPENDITURES	113381	132074	179431	94686	122784	133376	160998	83191	107541	87513
U.S. GOVERNMENT RECEIPTS:										
RECEIPTS FROM LEASE (GRD FAC)	0	0	0	0	0	0	0	0	0	0
NON-GOVERMENT DATA SALES AND GROUND STATION FEES	16526	19728	22585	24830	25680	24455	29485	32720	33815	36195
ASSET RECOUPMENT	0	0	0	0	0	0	0	0	0	0
TDRSS USEAGE FEES	0	0	0	0	0	0	0	0	0	0
ROYALTY FEES	0	0	0	0	0	0	0	0	0	0
TAX REVENUE	0	0	0	0	0	0	0	0	0	0
DIVIDENDS RECEIVED	0	0	0	0	0	0	0	0	0	0
TOTAL US GOV'T RECEIPTS	16576	19728	22585	24830	25680	24455	29485	32720	33815	36195
NET US GOV'T EXPENDITURES	96855	112346	156846	69856	97104	108921	131510	50471	73726	51318

DISCOUNT RATE	PRESENT VALUE "A"	PRESENT VALUE "B"	TOTAL PRESENT VALUE
0.10	610037	179866	789904
0.15	506960	73536	580496
0.20	429511	34534	464045
0.25	369964	17633	387597
0.30	323229	9545	332774

PRESENT VALUE OF "A" IS THE PRESENT VALUE OF THE CASH FLOWS, YEAR 1 THROUGH 10
PRESENT VALUE OF "B" IS THE PRESENT VALUE OF THE CASH FLOWS, YEAR 11 AND AFTER

FINANCIAL EXHIBIT 6.2 GOVERNMENT OWNERSHIP AND OPERATION (CONTINUED OWNERSHIP AND OPERATION)

PRIVATE OWNERSHIP AND OPERATION

LAND REMOTE SENSING SYSTEM
FISCAL YEARS 1985-1994
FINANCIAL PROJECTIONS
PROJECTED STATEMENT OF INCOME
$$$

AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS; 6% INFLATION RATE ASSUMED

	FISCAL YEARS									
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
REVENUE										
DATA-FEDERAL	10180	13130	14250	14120	14300	14340	17850	20980	24310	27340
-NON-FEDERAL	7790	9760	11260	12030	12960	10970	15190	17570	17750	19170
FOREIGN STATION FEES	8736	9968	11325	12000	12720	13485	14295	15150	16065	17025
OTHER REVENUE	0	0	0	0	0	0	0	0	0	0
ADDITIONAL FEDERAL PURCHASE	160000	142500	180000	125000	120000	155000	180000	215000	175000	155000
TOTAL REVENUE	186706	175358	216835	163950	159980	193795	227335	268700	233125	218535
DIRECT COSTS:										
PROCESSING	12482 (37)	*13571	13450	12326	11520	9972	11520	13299	14545	15482
ARCHIVAL	2596 (37)	2915	2914	2649	2469	2088	2484	2918	3216	3434
SALES	5014 (37)	5238	5210	5020	4733	4109	4757	5300	5633	5951
ROYALTIES	0	0	0	0	0	0	0	0	0	0
TOTAL DIRECT COSTS	20093	21724	21573	19995	18722	16249	18761	21517	23393	24866
GROSS MARGIN	166613	153634	195262	143955	141258	177546	208574	247183	209732	193669
OTHER OPERATING COSTS:										
INDIRECT COSTS	5009	5310	5628	5966	6324	6703	7105	7532	7984	8463
RESEARCH & DEVELOPMENT	1068	1714	1473	1550	1599	1552	1893	2143	2325	2541
ADVERTISING & PROMOTION	1425	1643	1842	1948	1999	1940	2367	2685	2906	3177
COMMUNICATIONS COST:										
-TDRSS	6235 (38)	7134	7728	7218	6935	5655	7470	9404	10552	11686
-DOMSAT	352 (38)	396	399	395	98	73	108	142	164	184
LEASE COSTS-GROUND SEGMENT	26100	26100	26100	26100	23120	23120	23120	23120	23120	23120
SPACE SEGMENT	0	0	0	0	0	0	0	0	0	0
DEPRECIATION-GROUND SEGMENT	0	0	0	0	0	0	0	0	0	0
-SPACE SEGMENT	150225	78013	119387	40850	40850	64838	81225	81225	81225	57238
INTEREST	18653	15378	14973	15465	13567	15149	15231	15321	5569	11000
OTHER EXPENSES	0	0	0	0	0	0	0	0	0	0
TOTAL INDIRECT EXPENSES	208082	135804	177527	99499	94493	119030	138520	141456	133845	117409
BEFORE TAX PROFIT-OPERATIONS	-41469	17831	17735	44456	46765	58516	70055	105727	75887	76260
INTEREST INCOME	0	0	0	0	0	0	0	0	0	0
BEFORE TAX PROFIT-OPERATIONS	-41469	17831	17735	44456	46765	58516	70055	105727	75887	76260
PROVISION FOR FEDERAL TAXES	21149	-9094	-9045	-22673	-23850	-29843	-35728	-53921	-38702	-38893
INVESTMENT TAX CREDIT	35762	9465	14183	5793	8764	10035	12502	4400	6600	4400
R&D TAX CREDIT	160	177	221	234	240	253	284	322	349	381
NET INCOME	15603	18399	23094	27810	31919	38941	47113	56528	44133	42149

FINANCIAL EXHIBIT 6.3.1 PRIVATE OWNERSHIP AND OPERATION

*SEE APPENDIX B.

PRIVATE OWNERSHIP AND OPERATION

LAND REMOTE SENSING SYSTEM
FISCAL YEARS 1985-1994
FINANCIAL PROJECTIONS
PROJECTED BALANCE SHEETS
***

AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS; 6% INFLATION RATE ASSUMED

	FISCAL YEARS									
ASSETS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
FIXED ASSETS:										
GROUND SEGMENT	0	0	0	0	0	0	0	0	0	0
SPACE SEGMENT	357620	452270	594100	652030	739670	840020	965040	1009040	1075040	1119040
TOTAL FIXED ASSETS	357620	452270	594100	652030	739670	840020	965040	1009040	1075040	1119040
LESS:ACCUMULATED DEPRECIATION	150233	228767	348150	389000	429850	494687	575912	657137	738362	795600
NET FIXED ASSETS	207387	223503	245950	263030	309820	345333	389128	351903	336678	323440
CURRENT ASSETS	38364	36032	44555	33688	32873	39821	46713	55212	47902	44904
OTHER CURRENT ASSETS	0	0	0	0	0	0	0	0	0	0
TOTAL ASSETS	245751	259536	290505	296718	342693	385153	435840	407115	384580	368344
CAPITALIZATION AND LIABILITIES										
CAPITALIZATION:										
CONTRIBUTED CAPITAL	75000	75000	75000	75000	75000	75000	75000	75000	75000	75000
RETAINED EARNINGS	15603	34002	57096	84906	116825	155765	202878	259406	303539	345688
CUMULATIVE DIVIDENDS PAID	0	0	0	0	0	0	0	0	-113120	-170305
TOTAL CAPITALIZATION	90603	109002	132096	159906	191825	230765	277878	334406	265419	250383
LONG-TERM DEBT	139803	136121	140587	123337	137719	138460	139277	50624	100000	100000
CURRENT LIABILITIES	15346	14413	17822	13475	13149	15928	18685	22085	19161	17962
TOTAL LIABILITIES	155148	150534	158409	136813	150868	154388	157962	72709	119161	117962
TOTAL LIAB AND CAPITALIZATION	245751	259536	290505	296718	342693	385153	435840	407115	384580	368344

FINANCIAL EXHIBIT 6.3.2 PRIVATE OWNERSHIP AND OPERATION

USGS

PRIVATE OWNERSHIP AND OPERATION

LAND REMOTE SENSING SYSTEM
FISCAL YEARS 1985-1994
FINANCIAL PROJECTION
PROJECTED STATEMENT OF CHANGES
IN FINANCIAL POSITION
***
FISCAL YEARS

AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS; 6% INFLATION RATE ASSUMED

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
USES OF WORKING CAPITAL:										
NET LOSS	0	0	0	0	0	0	0	0	0	0
ITEMS WHICH DO NOT PROVIDE (USE) WORKING CAPITAL:										
DEPRECIATION AND AMORT	-150233	-78533	-119383	-40850	-40850	-64838	-81225	-81225	-81225	-57238
WORKING CAP APPLIED TO OPER	-150233	-78533	-119383	-40850	-40850	-64838	-81225	-81225	-81225	-57238
PAYMENT OF DIVIDENDS	0	0	0	0	0	0	0	0	113120	57185
ADDITIONS TO EQUIPMENT	357670	94650	141830	57930	87640	100350	125020	44060	66000	44000
REDUCTION IN L.T. DEBT	0	3682	0	17250	0	0	0	88653	0	0
INCREASE IN WORKING CAPITAL	23019	0	5114	0	0	4169	4135	5100	0	0
	230456	19798	27560	34330	46790	39681	47930	56528	97895	43947
SOURCES OF WORKING CAPITAL:										
NET INCOME	15803	18399	23094	27810	31919	38941	47113	56528	44133	42149
PROCEEDS FROM SALE OF C/S	75000									
PROCEEDS FROM L.T. DEBT	139803	0	4466	0	14382	741	817	0	49376	0
DECREASE IN WORKING CAPITAL	0	1399	0	6520	489	0	0	0	4386	1799
	230406	19798	27560	34330	46790	39681	47930	56528	97895	43947
CHANGES IN WORKING CAPITAL:										
INCREASE(DECREASE) TO CURRENT ASSETS	38354	-2332	8523	-10867	-816	6948	6892	8500	-7310	-2998
INCREASE(DECREASE) TO CURRENT LIABILITIES	15336	-933	3409	-4347	-326	2779	2757	3400	-2924	-1199
INCREASE(DECREASE) IN WORKING CAPITAL	23019	-1399	5114	-6520	-489	4169	4135	5100	-4386	-1799

FINANCIAL EXHIBIT 6.3.3 PRIVATE OWNERSHIP AND OPERATION

PRIVATE OWNERSHIP AND OPERATION

(DIVIDEND DISTRIBUTIONS NOT INCLUDED)

LAND REMOTE SENSING SYSTEM
FISCAL YEARS 1985-1994
FINANCIAL PROJECTIONS
PROJECTED CASH FLOW

AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS; 6% INFLATION RATE ASSUMED

	FISCAL YEARS 1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
APPLICATIONS OF CASH:										
NET LOSS	0	0	0	0	0	0	0	0	0	0
ITEMS WHICH DO NOT PROVIDE CASH:										
DEPRECIATION	150233	78533	119383	40850	40850	64838	81225	81225	81225	57238
ADDITIONS TO FIXED ASSETS	-357620	-94650	-141830	-57930	-87640	-100350	-125020	-44000	-66000	-44000
INCREASE IN ACCOUNTS REC	-30691	1065	-6818	8693	653	-5559	-5513	-6800	5848	2398
TAX ADJUSTMENT	-57071	-569	-5359	16646	14846	19575	22942	49198	31754	34111
TOTAL APPLICATIONS OF CASH	-295149	-14620	-34624	8259	-31291	-21496	-26367	79624	52827	49747
SOURCES OF CASH:										
NET INCOME	15603	18399	23094	27810	31919	38941	47113	56528	44133	42149
INCREASE IN CURRENT LIAB.	15346	-933	3409	-4347	-326	2779	2757	3400	-2924	-1199
TAX ADJUSTMENT	0	0	0	0	0	0	-22942	-49198	-31754	-34111
TOTAL SOURCES OF CASH	30948	17466	26503	23463	31592	41720	26928	10730	9456	6838
CASH FLOW	-264201	2847	-8121	31723	301	20224	561	90353	62282	56585

DISCOUNT RATE	PRESENT VALUE "A"	PRESENT VALUE "B"	TOTAL PRESENT VALUE
0.10	-120159	198328	78170
0.15	-144609	81084	-63524
0.20	-158457	38079	-120379
0.25	-165719	19443	-146277
0.30	-168840	10525	-158316

PRESENT VALUE OF "A" IS THE PRESENT VALUE OF THE CASH FLOWS, YEAR 1 THROUGH 10
PRESENT VALUE OF "B" IS THE PRESENT VALUE OF THE CASH FLOWS, YEAR 11 AND AFTER

DEBT TO CAPITALIZATION RATIO	0.58	0.72	0.83	1.17	1.27	1.49	1.76	4.60	2.23	2.12
RETURN ON ASSETS	0.06	0.07	0.08	0.09	0.09	0.10	0.11	0.14	0.11	0.11
RETURN ON CAPITALIZATION	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17

FINANCIAL EXHIBIT 6.3.4 PRIVATE OWNERSHIP AND OPERATION

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USGS

SCENARIO # 3
PRIVATE OWNERSHIP AND OPERATION

LAND REMOTE SENSING SYSTEM
FISCAL YEARS 1985-1994
FINANCIAL PROJECTIONS
PROJECTED U.S. GOVERMENT CASH FLOWS

AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS; 6% INFLATION RATE ASSUMED

	FISCAL YEARS									
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
U.S. GOVERMENT EXPENDITURES:										
INFORMATION PRODUCTS	10180	13130	14250	14120	14300	14340	17850	20980	24310	27340
ASSET PURCHASES	0	0	0	0	0	0	0	0	0	0
OPERATIONS COSTS(NET OF RE-IMBURSEMENTS	0	0	0	0	0	0	0	0	0	0
R&D COSTS	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
EQUITY CONTRIBUTION	0	0	0	0	0	0	0	0	0	0
SUBSIDY	160000	142500	180000	125000	120000	155000	180000	215000	175000	155000
TOTAL US GOV'T EXPENDITURES	180180	165630	204250	149120	144300	179340	207850	245980	209310	192340
U.S. GOVERNMENT RECEIPTS:										
RECEIPTS FROM LEASE(GRD FAC)	26100	26100	26100	26100	0	0	0	0	0	0
NON-GOVERMENT DATA SALES AND GROUND STATION FEES	0	0	0	0	0	0	0	0	0	0
ASSET RECOUPMENT	279700	0	0	0	0	0	0	0	0	0
TDRSS USEAGE FEES	5235	7134	7728	7218	6935	5655	7470	9284	10552	11686
ROYALTY FEES	0	0	0	0	0	0	0	0	0	0
TAX REVENUE	0	0	0	0	0	0	22942	49198	31754	34111
DIVIDENDS RECEIVED	0	0	0	0	0	0	0	0	0	0
TOTAL US GOV'T RECEIPTS	311035	33234	33828	33318	6935	5655	30412	58492	42306	45798
NET US GOV'T EXPENDITURES	-130855	132396	170422	115802	137365	173685	177438	187488	167003	146543

DISCOUNT RATE	PRESENT VALUE "A"	PRESENT VALUE "B"	TOTAL PRESENT VALUE
0.10	686777	513623	1200399
0.15	519669	209984	729658
0.20	399897	98614	498511
0.25	312099	50352	362451
0.30	246421	27256	273677

PRESENT VALUE OF "A" IS THE PRESENT VALUE OF THE CASH FLOWS, YEAR 1 THROUGH 10
PRESENT VALUE OF "B" IS THE PRESENT VALUE OF THE CASH FLOWS, YEAR 11 AND AFTER

FINANCIAL EXHIBIT 6.3.5 PRIVATE OWNERSHIP AND OPERATION

PHASED PRIVATE OWNERSHIP (PRIVATE SECTOR MARKETING) 6)

LAND MOBILE SERVICE SYSTEM
FISCAL YEARS 1985-1994
FINANCIAL PROJECTIONS
PROJECTED STATEMENT OF INCOME

AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS; 6% INFLATION RATE ASSUMED

	FISCAL YEARS 1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
REVENUE										
DATA-FEDERAL	10180	13130	14250	14120	14300	14240	17850	20980	24310	27540
-NON-FEDERAL	7790	9760	11260	12850	12960	10970	15190	17570	17750	19170
MOBILE STATION FEES	8736	9968	11325	12000	12720	13485	14295	15150	16065	17025
OTHER REVENUE	0	0	0	0	0	0	0	0	0	0
ADDITIONAL FEDERAL PURCHASE	0	0	0	0	0	0	0	0	0	0
TOTAL REVENUE	26706	32858	36835	38950	39980	38795	47335	53700	58125	63535
DIRECT COSTS:										
PROCESSING	0 (37)	0	0	0	0	0	0	0	0	0
ARCHIVAL	0 (37)	0	0	0	0	0	0	0	0	0
SALES	0 (37)	0	0	0	0	0	0	0	0	0
ROYALTIES	33500	33500	33500	33500	33500	33500	37868	42960	46500	50828
TOTAL DIRECT COSTS	33500	33500	33500	33500	33500	33500	37868	42960	46500	50828
GROSS MARGIN	-6794	-642	3335	5450	6480	5295	9467	10740	11625	12707
OTHER OPERATING COSTS:										
INDIRECT COSTS	0	0	0	0	0	0	0	0	0	0
RESEARCH & DEVELOPMENT	0	0	0	0	0	0	0	0	0	0
ADVERTISING & PROMOTION	1425	1643	1842	1948	1999	1940	2367	2685	2906	3177
COMMUNICATIONS COST:										
-TDRSS	0(38)	0	0	0	0	0	0	0	0	0
-DOMSAT	0(38)	0	0	0	0	0	0	0	0	0
LEASE COSTS-GROUND SEGMENT	0	0	0	0	0	0	0	0	0	0
SPACE SEGMENT	0	0	0	0	0	0	0	0	0	0
DEPRECIATION-GROUND SEGMENT	0	0	0	0	0	0	0	0	0	0
-SPACE SEGMENT	0	0	0	0	0	0	0	0	0	0
INTEREST	369	385	612	619	492	291	110	0	0	0
OTHER EXPENSES	0	0	0	0	0	0	0	0	0	0
TOTAL INDIRECT EXPENSES	1794	2028	2454	2566	2491	2231	2477	2685	2906	3177
BEFORE TAX PROFIT-OPERATIONS	-8588	-2670	881	2884	3989	3064	6990	8055	8719	9530
INTEREST INCOME	0	0	0	0	0	0	0	0	0	0
BEFORE TAX PROFIT-OPERATIONS	-8588	-2670	881	2884	3989	3064	6990	8055	8719	9530
PROVISION FOR FEDERAL TAXES	4380	1362	-449	-1471	-2034	-1563	-3565	-4108	-4447	-4860
INVESTMENT TAX CREDIT	0	0	0	0	0	0	0	0	0	0
R&D TAX CREDIT	0	0	0	0	0	0	0	0	0	0
NET INCOME	-4208	-1308	432	1413	1955	1501	3425	3947	4272	4670

FINANCIAL EXHIBIT 6.4.1 PHASED PRIVATE OWNERSHIP (PRIVATE SECTOR MARKETING)

PHASED PRIVATE OWNERSHIP
(PRIVATE SECTOR MARKETING)

LAND REMOTE SENSING SYSTEM
FISCAL YEARS 1985-1994
FINANCIAL PROJECTIONS
PROJECTED BALANCE SHEETS
AS OF
FISCAL YEARS

AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS; 6% INFLATION RATE ASSUMED

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
ASSETS										
FIXED ASSETS:										
GROUND SEGMENT	0	0	0	0	0	0	0	0	0	0
SPACE SEGMENT	0	0	0	0	0	0	0	0	0	0
TOTAL FIXED ASSETS	0	0	0	0	0	0	0	0	0	0
LESS:ACCUMULATED DEPRECIATION	0	0	0	0	0	0	0	0	0	0
NET FIXED ASSETS	0	0	0	0	0	0	0	0	0	0
CURRENT ASSETS	5488	6752	7569	8003	8215	7972	9726	11034	11943	13055
OTHER CURRENT ASSETS	0	0	0	0	0	0	0	0	0	0
TOTAL ASSETS	5488	6752	7569	8003	8215	7972	9726	11034	11943	13055
CAPITALIZATION AND LIABILITIES										
CAPITALIZATION:										
CONTRIBUTED CAPITAL	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
RETAINED EARNINGS	-4208	-5516	-5085	-3672	-1717	-216	3210	7157	11429	16095
CUMULATIVE DIVIDENDS PAID	0	0	0	0	0	0	-1274	-4536	-8263	-12766
TOTAL CAPITALIZATION	-208	-1516	-1085	328	2283	3784	5936	6621	7166	7329
LONG-TERM DEBT	3500	5567	5626	4474	2646	998	0	0	0	0
CURRENT LIABILITIES	2195	2701	3028	3201	3286	3189	3891	4414	4777	5726
TOTAL LIABILITIES	5695	8268	8653	7675	5932	4187	3891	4414	4777	5726
TOTAL LIAB AND CAPITALIZATION	5488	6752	7569	8003	8215	7972	9726	11034	11943	13055

FINANCIAL EXHIBIT 6.4.2 PHASED PRIVATE OWNERSHIP (PRIVATE SECTOR MARKETING)

PHASED PRIVATE OWNERSHIP
(PRIVATE SECTOR MARKETING)

LAND REMOTE SENSING SYSTEM
FISCAL YEARS 1985-1994
FINANCIAL PROJECTIONS
PROJECTED STATEMENT OF CHANGES
IN FINANCIAL POSITION

AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS; 6% INFLATION RATE ASSUMED

	FISCAL YEARS 1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
USES OF WORKING CAPITAL:										
NET LOSS	4208	1308	0	0	0	0	0	0	0	0
ITEMS WHICH DO NOT PROVIDE (USE) WORKING CAPITAL:										
DEPRECIATION AND AMORT	0	0	0	0	0	0	0	0	0	0
WORKING CAP APPLIED TO OPER	4208	1308	0	0	0	0	0	0	0	0
PAYMENT OF DIVIDENDS	0	0	0	0	0	0	1374	3162	3727	4003
ADDITIONS TO EQUIPMENT	0	0	0	0	0	0	0	0	0	0
REDUCTION IN L.T. DEBT	0	0	0	1152	1828	1648	998	0	0	0
INCREASE IN WORKING CAPITAL	3293	758	490	261	127	0	1053	785	546	667
	7500	2067	490	1413	1955	1648	3425	3947	4272	4670
SOURCES OF WORKING CAPITAL:										
NET INCOME	0	0	432	1413	1955	1501	3425	3947	4272	4670
PROCEEDS FROM SALE OF C/S	4000									
PROCEEDS FROM L.T. DEBT	3500	2067	59	0	0	0	0	0	0	0
DECREASE IN WORKING CAPITAL	0	0	0	0	0	146	0	0	0	0
	7500	2067	490	1413	1955	1648	3425	3947	4272	4670
CHANGES TO WORKING CAPITAL:										
INCREASE(DECREASE) TO CURRENT ASSETS	5488	1264	817	435	212	-243	1755	1308	909	1112
INCREASE(DECREASE) TO CURRENT LIABILITIES	2195	506	327	174	85	-97	702	523	364	445
INCREASE(DECREASE) IN WORKING CAPITAL	3293	758	490	261	127	-146	1053	785	546	667

FINANCIAL EXHIBIT 6.4.3 PHASED PRIVATE OWNERSHIP (PRIVATE SECTOR MARKETING)

USGS

PHASED PRIVATE OWNERSHIP
(PRIVATE SECTOR MARKETING)

LAND REMOTE SENSING SYSTEM
FISCAL YEARS 1985-1994
FINANCIAL PROJECTIONS
PROJECTED CASH FLOW

AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS; 4% INFLATION RATE ASSUMED

	FISCAL YEARS									
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
APPLICATIONS OF CASH:										
NET LOSS	-4208	-1308	0	0	0	0	0	0	0	0
ITEMS WHICH DO NOT PROVIDE CASH:										
DEPRECIATION	0	0	0	0	0	0	0	0	0	0
ADDITIONS TO FIXED ASSETS	0	0	0	0	0	0	0	0	0	0
INCREASE IN ACCOUNTS REC	-4390	-1011	-654	-348	-169	195	-1404	-1046	-727	-889
TAX ADJUSTMENT	-4380	-1362	449	1471	2074	1563	0	0	0	0
TOTAL APPLICATIONS OF CASH	-12978	-3681	-205	1123	1865	1758	-1404	-1046	-727	-889
SOURCES OF CASH:										
NET INCOME	0	0	432	1413	1955	1501	3425	3947	4272	4670
INCREASE IN CURRENT LIAB.	2195	506	327	174	85	-97	702	523	364	445
TAX ADJUSTMENT	0	0	0	0	0	0	0	0	0	0
TOTAL SOURCES OF CASH	2195	506	759	1587	2039	1404	4127	4470	4636	5114
CASH FLOW	-10783	-3176	554	2710	3904	3162	2723	3424	3908	4225

DISCOUNT RATE	PRESENT VALUE "A"	PRESENT VALUE "B"	TOTAL PRESENT VALUE
0.10	331	14807	15139
0.15	-2257	6054	3797
0.20	-3939	2843	-1096
0.25	-5033	1452	-3581
0.30	-5737	786	-4951

DEBT TO CAPITALIZATION RATIO	-0.04	-0.18	-0.13	0.04	0.38	0.90	1.50	1.50	1.50	1.50
RETURN ON ASSETS	-0.77	-0.19	0.06	0.18	0.24	0.19	0.35	0.36	0.36	0.36
RETURN ON CAPITALIZATION			-0.40	4.30	0.86	0.40	0.39	0.60	0.60	0.60

FINANCIAL EXHIBIT 6.4.4 PHASED PRIVATE OWNERSHIP (PRIVATE SECTOR MARKETING)

SCENARIO # 4
PHASED PRIVATE OWNERSHIP
(PRIVATE SECTOR MARKETING)

LAND REMOTE SENSING SYSTEM
FISCAL YEARS 1985-1994
FINANCIAL PROJECTIONS
PROJECTED U.S. GOVERMENT CASH FLOWS
(M$)

	FISCAL YEARS 1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
U.S. GOVERMENT EXPENDITURES:										
INFORMATION PRODUCTS	10180	13130	14250	14120	14300	14340	17850	20980	24310	27340
ASSET PURCHASES	77920	94650	141030	57930	87640	100350	125020	44000	66000	44000
OPERATIONS COSTS(NET OF REIMBURSEMENTS	25461	27424	27601	26356	25144	23026	25975	29191	31541	33513
R&D COSTS	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
EQUITY CONTRIBUTION	0	0	0	0	0	0	0	0	0	0
SUBSIDY	0	0	0	0	0	0	0	0	0	0
TOTAL US GOV'T EXPENDITURES	123561	145204	193681	108406	137084	147716	178845	104171	131851	114853
U.S. GOVERNMENT RECEIPTS:										
RECEIPTS FROM LEASE(GRD FAC)	0	0	0	0	0	0	0	0	0	0
NON-GOVERMENT DATA SALES AND GROUND STATION FEES	0	0	0	0	0	0	0	0	0	0
ASSET RECOUPMENT	0	0	0	0	0	0	0	0	0	0
TDRSS USEAGE FEES	0	0	0	0	0	0	0	0	0	0
ROYALTY FEES	33500	33500	33500	33500	33500	33500	37868	42960	46500	50828
TAX REVENUE	0	0	0	0	0	0	3565	4108	4447	4860
DIVIDENDS RECEIVED	0	0	0	0	0	0	0	0	0	0
TOTAL US GOV'T RECEIPTS	33500	33500	33500	33500	33500	33500	41433	47068	50947	55688
NET US GOV'T EXPENDITURES	90061	111704	160181	74906	103584	114216	137412	57103	80904	59165

0.10	628763	207369	836132
0.15	519753	84781	604534
0.20	438187	39814	478002
0.25	375726	20329	396055
0.30	326891	11004	337896

USGS

FINANCIAL EXHIBIT 6.4.5 PHASED PRIVATE OWNERSHIP (PRIVATE SECTOR MARKETING)

LEGISLATIVELY CHARTERED, PRIVATELY OWNED CORPORATION

LAND REMOTE SENSING SYSTEM
FISCAL YEARS 1985-1994
FINANCIAL PROJECTIONS
PROJECTED STATEMENT OF INCOME

AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS; 6% INFLATION RATE ASSUMED

	FISCAL YEARS									
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
REVENUE										
DATA-FEDERAL	10180	13130	14250	14120	14300	14340	17850	20950	24310	27340
-NON-FEDERAL	7790	9760	11260	12830	12960	10970	15190	17570	17750	19170
FOREIGN STATION FEES	8736	9968	11325	12000	12720	13485	14295	15150	16065	17025
OTHER REVENUE	0	0	0	0	0	0	0	0	0	0
ADDITIONAL FEDERAL PURCHASE	160000	142500	180000	125000	120000	155000	180000	215000	175000	155000
TOTAL REVENUE	186706	175358	216835	163950	159980	193795	227335	268700	233125	218535
DIRECT COSTS:										
PROCESSING	12483(37)	13571	13450	12326	11520	9972	11520	13299	14545	15402
ARCHIVAL	2596(37)	2915	2914	2649	2469	2088	2484	2918	3216	3424
SALES	5014(37)	5238	5210	5020	4733	4189	4707	5300	5633	5951
ROYALTIES	0	0	0	0	0	0	0	0	0	0
TOTAL DIRECT COSTS	20093	21724	21573	19995	18722	16249	18761	21517	23393	24866
GROSS MARGIN	166613	153634	195262	143955	141258	177546	208574	247183	209732	193669
OTHER OPERATING COSTS:										
INDIRECT COSTS	5009	5310	5628	5966	6324	6703	7105	7532	7984	8463
RESEARCH & DEVELOPMENT	1068	1314	1473	1558	1599	1552	1893	2140	2333	2541
ADVERTISING & PROMOTION	1425	1643	1842	1948	1999	1940	2367	2605	2906	3177
COMMUNICATIONS COST:										
-TDRSS	5235(38)	7134	7728	7218	6935	5655	7470	9284	10552	11606
-INMSAT	359(38)	391	399	395	98	73	103	142	164	184
LEASE COSTS-GROUND SEGMENT	26100	26100	26100	26100	23120	23120	23120	23120	23120	23120
SPACE SEGMENT	0	0	0	0	0	0	0	0	0	0
DEPRECIATION-GROUND SEGMENT	0	0	0	0	0	0	0	0	0	0
SPACE SEGMENT	150233	78533	119383	40850	40850	64838	81225	81225	81225	57238
INTEREST	18553	15378	14973	15465	13567	15149	15231	15221	5569	11000
OTHER EXPENSES	0	0	0	0	0	0	0	0	0	0
TOTAL INDIRECT EXPENSES	208002	135804	177527	99499	94493	119030	138520	141456	137845	117408
BEFORE TAX PROFIT-OPERATIONS	-41469	17831	17735	44456	46765	58516	70055	105727	75887	76260
INTEREST INCOME	0	0	0	0	0	0	0	0	0	0
BEFORE TAX PROFIT-OPERATIONS	-41469	17831	17735	44456	46765	58516	70055	105727	75887	76260
PROVISION FOR FEDERAL TAXES	21149	-9094	-9045	-22673	-23850	-29843	-35728	-53921	-38702	-38893
INVESTMENT TAX CREDIT	35762	9465	14183	5793	8764	10035	12902	4400	6600	4400
R&D TAX CREDIT	160	197	221	214	240	233	284	322	349	381
NET INCOME	15603	18399	23094	27810	31919	38941	47113	56528	44133	42149

FINANCIAL EXHIBIT 6.5.1 LEGISLATIVELY-CHARTERED, PRIVATELY-OWNED CORPORATION

LEGISLATIVELY CHARTERED, PRIVATELY OWNED CORPORATION

LAND REMOTE SENSING SYSTEM.
FISCAL YEARS 1985-1994
FINANCIAL PROJECTIONS
PROJECTED BALANCE SHEETS
###

AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS; 6% INFLATION RATE ASSUMED

	FISCAL YEARS 1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
ASSETS										
FIXED ASSETS:										
GROUND SEGMENT	0	0	0	0	0	0	0	0	0	0
SPACE SEGMENT	357620	452270	594100	652030	739670	840020	965040	1009040	1075040	1119040
TOTAL FIXED ASSETS	357620	452270	594100	652030	739670	840020	965040	1009040	1075040	1119040
LESS: ACCUMULATED DEPRECIATION	150233	228767	348150	389000	429850	494687	575912	657137	738362	795600
NET FIXED ASSETS	207387	223503	245950	263030	309820	345333	389128	351903	336678	323440
CURRENT ASSETS	38364	36032	44555	33688	32073	39821	46713	55212	47902	44904
OTHER CURRENT ASSETS	0	0	0	0	0	0	0	0	0	0
TOTAL ASSETS	245751	259536	290505	296718	342693	385153	435840	407115	384580	368344
CAPITALIZATION AND LIABILITIES										
CAPITALIZATION:										
CONTRIBUTED CAPITAL	75000	75000	75000	75000	75000	75000	75000	75000	75000	75000
RETAINED EARNINGS	15603	34002	57096	84906	116825	155765	202878	259406	303539	345688
CUMULATIVE DIVIDENDS PAID	0	0	0	0	0	0	0	0	-113120	-170305
TOTAL CAPITALIZATION	90603	109002	132096	159906	191825	230765	277878	334406	265419	250383
LONG-TERM DEBT	139803	136121	140587	123337	137719	138460	139277	50624	100000	100000
CURRENT LIABILITIES	15346	14413	17822	13475	13149	15968	18685	22085	19161	17962
TOTAL LIABILITIES	155148	150534	158409	136813	150868	154428	157962	72709	119161	117962
TOTAL LIAB AND CAPITALIZATION	245751	259536	290505	296718	342693	385193	435840	407115	384580	368344

FINANCIAL EXHIBIT 6.5.2 LEGISLATIVELY-CHARTERED, PRIVATELY-OWNED CORPORATION

USGS

LEGISLATIVELY CHARTERED, PRIVATELY OWNED CORPORATION

LAND REMOTE SENSING SYSTEM
FISCAL YEARS 1985-1994
FINANCIAL PROJECTIONS
PROJECTED STATEMENT OF CHANGES IN FINANCIAL POSITION

AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS; 4% INFLATION RATE ASSUMED

FISCAL YEARS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
USES OF WORKING CAPITAL:										
NET LOSS	0	0	0	0	0	0	0	0	0	0
ITEMS WHICH DO NOT PROVIDE (USE) WORKING CAPITAL:										
DEPRECIATION AND AMORT	-150233	-70533	-119383	-40850	-40850	-64838	-81225	-81225	-81225	-57238
WORKING CAP APPLIED TO OPER	-150233	-70533	-119383	-40850	-40850	-64838	-81225	-81225	-81225	-57238
PAYMENT OF DIVIDENDS	0	0	0	0	0	0	0	0	113120	57185
ADDITIONS TO EQUIPMENT	357620	94650	141830	57930	87640	100350	125020	44000	66000	44000
REDUCTION IN L.T. DEBT	0	3682	0	17250	0	0	0	68653	0	0
INCREASE IN WORKING CAPITAL	23019	0	5114	0	0	4169	4135	5100	0	0
	230406	19798	27560	34330	46790	39681	47930	56528	97895	43947
SOURCES OF WORKING CAPITAL:										
NET INCOME	15803	18399	23094	27810	31919	38941	47113	56528	44133	42149
PROCEEDS FROM SALE OF C/S	75000									
PROCEEDS FROM L.T. DEBT	139803	0	4466	0	14382	741	817	0	49376	0
DECREASE IN WORKING CAPITAL	0	1399	0	6520	489	0	0	0	4386	1799
	230406	19798	27560	34330	46790	39681	47930	56528	97895	43947
CHANGES TO WORKING CAPITAL:										
INCREASE(DECREASE) TO CURRENT ASSETS	38364	-2332	8523	-10867	-816	6948	8870	8500	-7310	-2998
INCREASE(DECREASE) TO CURRENT LIABILITIES	15346	-933	3409	-4347	-326	2779	3757	3400	-2924	-1199
INCREASE(DECREASE) IN WORKING CAPITAL	23019	-1399	5114	-6520	-489	4169	4135	5100	-4386	-1799

FINANCIAL EXHIBIT 6.5.3 LEGISLATIVELY-CHARTERED, PRIVATELY-OWNED CORPORATION

LEGISLATIVELY CHARTERED PRIVATELY OWNED CORPORATION
(DIVIDEND DISTRIBUTIONS NOT INCLUDED)

LAND REMOTE SENSING SYSTEM
FISCAL YEARS 1985-1994
FINANCIAL PROJECTIONS
PROJECTED CASH FLOW
###

AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS; 6% INFLATION RATE ASSUMED

FISCAL YEARS	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
APPLICATIONS OF CASH:										
NET LOSS	0	0	0	0	0	0	0	0	0	0
ITEMS WHICH DO NOT PROVIDE CASH:										
DEPRECIATION	150233	78533	119383	40850	40850	64838	81225	81225	81225	57238
ADDITIONS TO FIXED ASSETS	-357620	-94650	-141830	-57930	-87640	-100350	-125020	-44000	-66000	-44000
INCREASE IN ACCOUNTS REC	-30691	1865	-6818	8693	653	-5559	-5513	-6800	5848	2398
TAX ADJUSTMENT	-57071	-569	-5359	16646	14846	19575	22942	49198	31754	34111
TOTAL APPLICATIONS OF CASH	-295149	-14820	-34624	8259	-31291	-21496	-26367	79624	52827	49747
SOURCES OF CASH:										
NET INCOME	15603	18399	23094	27810	31919	389	47113	56528	44133	42149
INCREASE IN CURRENT LIAB.	15346	-933	3409	-4347	-326	2779	2757	3400	-2924	-1199
TAX ADJUSTMENT	0	0	0	0	0	0	-22942	-49198	-31754	-34111
TOTAL SOURCES OF CASH	30948	17466	26503	23463	31592	41720	26928	10730	9456	6838
CASH FLOW	-264201	2647	-8121	31723	301	20224	561	90353	62282	56585

DISCOUNT RATE	PRESENT VALUE "A"	PRESENT VALUE "B"	TOTAL PRESENT VALUE
0.10	-120159	198328	78170
0.15	-144609	81084	-63524
0.20	-158457	38079	-120379
0.25	-165719	19443	-146277
0.30	-168840	10525	-158316

DEBT TO CAPITALIZATION RATIO	0.58	0.72	0.83	1.17	1.27	1.49	1.76	4.60	2.27	2.12
RETURN ON ASSETS	0.06	0.07	0.08	0.09	0.09	0.10	0.11	0.14	0.11	0.11
RETURN ON CAPITALIZATION	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17

FINANCIAL EXHIBIT 6.5.4 LEGISLATIVELY-CHARTERED, PRIVATELY-OWNED CORPORATION

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SCENARIO # 5
LEGISLATIVELY CHARTERED, PRIVATELY OWNED CORPORATION

LAND REMOTE SENSING SYSTEM
FISCAL YEARS 1985-1994
FINANCIAL PROJECTIONS
PROJECTED U.S. GOVERNMENT CASH FLOWS

AMOUNTS EXPRESSED IN THOUSANDS OF CURRENT YEAR DOLLARS; 6% INFLATION RATE ASSUMED

	FISCAL YEARS									
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
U.S. GOVERNMENT EXPENDITURES:										
INFORMATION PRODUCTS	10180	13130	14250	14130	14300	14340	17850	20700	24310	27340
ASSET PURCHASES	0	0	0	0	0	0	0	0	0	0
OPERATIONS COSTS(NET OF REIMBURSEMENTS	0	0	0	0	0	0	0	0	0	0
R&D COSTS	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
EQUITY CONTRIBUTION	24750	0	0	0	0	0	0	0	0	0
SUBSIDY	160000	142500	180000	125040	120000	155000	180000	215000	175000	155000
TOTAL US GOV'T EXPENDITURES	204930	165630	204250	149120	144300	179340	207850	245980	209310	192340
U.S. GOVERNMENT RECEIPTS:										
RECEIPTS FROM LEASE(GRD FAC)	26100	26100	26100	26100	0	0	0	0	0	0
NON-GOVERNMENT DATA SALES AND GROUND STATION FEES	0	0	0	0	0	0	0	0	0	0
ASSET RECOUPMENT	279700	0	0	0	0	0	0	0	0	0
TDRSS USEAGE FEES	5235	7134	7728	7218	6935	5655	7470	9284	10552	11686
ROYALTY FEES	0	0	0	0	0	0	0	0	0	0
TAX REVENUE	0	0	0	0	0	0	22942	49198	31754	34111
DIVIDENDS RECEIVED	0	0	0	0	0	0	0	0	37330	18871
TOTAL US GOV'T RECEIPTS	311035	33234	33828	33318	6935	5655	30412	58482	79635	64669
NET US GOV'T EXPENDITURES	-106105	132396	170422	115802	137365	173685	177438	187498	129675	127672

DISCOUNT RATE	PRESENT VALUE "A"	PRESENT VALUE "B"	TOTAL PRESENT VALUE
0.10	686170	447481	1133650
0.15	525914	182947	708862
0.20	410240	85915	496155
0.25	324863	43868	368730
0.30	260570	23746	284317

PRESENT VALUE OF "A" IS THE PRESENT VALUE OF THE CASH FLOWS, YEAR 1 THROUGH 10
PRESENT VALUE OF "B" IS THE PRESENT VALUE OF THE CASH FLOWS, YEAR 11 AND AFTER

FINANCIAL EXHIBIT 6.5.5 LEGISLATIVELY-CHARTERED, PRIVATELY-OWNED CORPORATION

7. NONFINANCIAL ISSUES

A general overview is presented in the following paragraphs of the numerous nonfinancial issues related to the establishment of an operational land remote sensing system. These issues are not new having been discussed for at least the last half-decade. Many of the issues still being discussed were identified at the start of the ERTS/LANDSAT program over a decade ago; others that have been identified in recent years as more detailed proposals for a permanent operational framework have been put forward [2, 6, 8, 12, 13, 19, 37-46].

This section begins with an analysis of the philosophical and practical dimensions of the land remote sensing debate; it addresses the question "why has it been so difficult to develop a permanent framework for using this technology?" Issues are then discussed in terms of four broad categories: international and foreign policy, national security, legal/regulatory and institutional. Finally, there is a general summary of the policy requirements which must be met for success in creating an effective permanent framework for U.S. land remote sensing activities.

7.1 Commercialization of Land Remote Sensing: A Persistent Political Question

The experimental U.S. remote sensing program has been underway since the late 1960s, with the first satellite put in orbit over a decade ago; over $1.5 billion has been invested in the program to date. Over the past five years, there has been an extended and complex debate over how best to bring land remote sensing into operational status. Suggestions have included: creating an international consortium modeled on Intelsat to own and operate the system;* reconfiguring NASA as system operator;** creating a new private corporation for earth observations;*** and, after extensive review during the Carter Administration, assigning the management role to the National Oceanographic and Atmospheric Administration (NOAA) pending "eventual" transfer to private sector ownership and operation.**** Now, the current Administration has decided to terminate a direct

*This suggestion is contained in National Academy of Sciences, op. cit.

**This suggestion is contained in Augenstein, Shapley and Skolnikoff, op. cit., and a bill introduced in 1979 by Senator Adlai Stevenson (D-Ill.), S. 663, 96th Congress, 1st Session.

***This suggestion is contained in a bill introduced in 1979 by Senator Harrison Schmitt (R-N.M.), S. 875, 96th Congress, 1st Session.

****The Carter decision was announced in November 1979; it was contained in Presidential Directive 54.

government role in operating the system as soon as possible, with land observation satellites to be taken over by the private sector, either in combination with weather satellites or by themselves.* In stark contrast, in their responses to a Department of Commerce Request for Information in the fall of 1982, three major aerospace firms which have been intimately involved in earth observation programs suggested that the whole discussion of an operational system is premature, and that any move to commercialize land remote sensing at this time would undermine the long-term viability of the enterprise!

The point here is not to analyze these specific proposals in any detail, but rather to suggest why there have been so many widely different answers to a single question: "How to assure that U.S. society gets the maximum benefits from its investment in remote sensing research and development to date?" If it reveals nothing else, the history of the discussion so far tells us that there is no one "right" answer to that question.

Why is this so? There are both practical and philosophical reasons. They include:

- The LANDSAT demonstration program has not been a success, if success is defined as developing the information and experience required to make informed decisions with respect to the desirability of public vs. private ownership and the form of private ownership
- There is a mismatch between the capabilities provided by land observation technology and the structure of both public and private sector organizations which might benefit from those capabilities
- Land remote sensing can provide a wide variety of benefits ranging from intangible public goods to high dollar value private returns; there are strong differences in political philosophy and values over which of these benefits should be given priority in designing a permanent framework for operating the technology
- In a related way, there are persistent differences in perspective about the respective roles of government and the private sector in providing various services to society and about how best to insure return to the public from its investments in government research and development programs
- Finally, land remote sensing has inherently global dimensions, if only because it operates using resources which are recognized as global "commons"—outer space and the frequency spectrum. While it may be possible to design a framework for the technology on a national basis, there are inescapable international dimensions to the problem.

*Remote sensing policy under the Reagan Administration is reviewed in M. Mitchell Waldrop, "What Price Privatizing LANDSAT?" Science, February 11, 1983, pp. 752-754.

It is beyond the scope of this report to discuss any of these general concerns in depth, yet they provide the context within which the specific issues are discussed below. The recent discussions of commercialization, in particular, have been carried out against the backdrop of an expectation created early in the LANDSAT program that land remote sensing would create billions of dollars annually in benefits.* If indeed the technology, as soon as it was relatively mature, could have such an impact, and if the benefits could be provided as private goods, then clearly rapid commercialization was a plausible objective and potential operators should be struggling to be first in line to have an opportunity to profit from remote sensing.

That is clearly not the case. The market assessment presented in Section 4 indicates the limited size of the current market for LANDSAT products and suggests only moderate mid-term prospects for growth in products for which specific users would be willing to pay a significant price. There may well be extremely high benefits to society from employing land remote sensing technology, but it seems extremely difficult to provide those benefits in terms of private goods. The breakdown of potential benefits given in Table 7.1 may be useful in understanding the mixed public good/private good results of the use of this capability; that understanding is in turn a key to recognizing why it has been so difficult to reach agreement on most of the issues under debate.

In the end it is the political questions—the division of roles and responsibilities between the public and private sector—which is driving, and complicating, all of the discussions surrounding the permanent framework for land remote sensing. In many ways the current situation may be considered unique in that it involves a technology developed and demonstrated totally under public sector auspices and for which the federal government remains a major user, yet which has still been expected throughout its development to be eventually transferred to the private sector. Current patterns of operation, with users both inside and outside the government, run the risk of being disrupted by a possible transfer of the

*For example, in 1975 the value over a two-year period of information on wheat crops was estimated at $400 million to the United States and $1.7 billion to the rest of the world; benefits of a 1985 operational system (for information on wheat only) were estimated at $300 million/year for the United States and $1.5 billion/year for the rest of the world. American Institute of Aeronautics and Astronautics, Space: A Resource for Earth (New York, 1977), p. 28.

TABLE 7.1 U.S. INTERESTS IN CIVIL REMOTE SENSING
TECHNICAL INTERESTS
A. BASIC SCIENTIFIC KNOWLEDGE AND UNDERSTANDING OF VARIOUS FEATURES OF THE EARTH
B. GLOBAL CAPACITIES FOR DEALING WITH NATIONAL AND INTERNATIONAL PROBLEMS IN AGRICULTURE, ENERGY, ETC.
C. TECHNOLOGY DEVELOPMENT PROVIDING ADVANCEMENTS IN REMOTE SENSING AND RELATED FIELDS
PUBLIC INTERESTS
A. SPECIFIC FEDERAL NEEDS AND FUNCTIONS WITHIN VARIOUS AGENCIES AND PROGRAMMATIC AREAS
B. PUBLIC INTEREST NEEDS AND BENEFITS FOR STATES, LOCALITIES, UNIVERSITIES AND GENERAL PUBLIC
C. SUPPORT FOR U.S. DECISION MAKING BY PROVIDING INFORMATION ON SUCH ITEMS AS CROP PRODUCTION IN FOREIGN COUNTRIES
ECONOMIC INTEREST
A. ECONOMIC INTERESTS OF U.S. PRIVATE SECTOR IN A VARIETY OF FIELDS, I.E., OIL AND MINERAL EXPLORATION
B. U.S. COMPETITIVE POSITION IN SPACE TECHNOLOGY INCLUDING MANUFACTURING AND SERVICING OF EQUIPMENT, DISSEMINATION OF DATA, PROVISION OF TECHNICAL SERVICES AND ANALYSIS
C. REDUCTION IN INFORMATION COSTS FOR FEDERAL, STATE, LOCAL AND PRIVATE SOURCES
D. CONTRIBUTION TO GENERAL ECONOMIC GROWTH BOTH OF LDCs AND THE WORLD AS A WHOLE
E. RETURN ON SPACE INVESTMENT WITH ECONOMIC AND OTHER KINDS OF BENEFITS FOR NOMINAL COST
U.S. INTERNATIONAL INTERESTS
A. SUPPORT FOREIGN POLICY THROUGH PROVISION OF INFORMATION AND RELATED SERVICES
B. MAINTAIN U.S. LEADERSHIP WITH THIS TECHNOLOGY AS ILLUSTRATION OF CONTINUED LEADERSHIP IN SPACE
C. SUPPORT U.S. POSITION WITH LDCs HONORING COMMITMENTS FOR TECHNOLOGY AND BUTTRESSING POSITION IN NORTH/SOUTH DIALOGUES, THE U.N. AND OTHER FORUMS
D. SUPPORT INTERNATIONAL COOPERATION IN SPACE VIA COMMITMENTS TO FOREIGN GROUND STATIONS AND OTHER INVESTORS FOR DATA CONTINUITY AND EVENTUAL SYSTEMS COMPATIBILITY
E. PROMOTE OPENNESS THROUGH THE TREATMENT OF GENERAL INFORMATION AS AN INTERNATIONAL GOOD
F. GENERAL INTERNATIONAL COOPERATION AS MODEL OF EFFECTIVE WORKING RELATIONSHIPS AMONG NATIONS
SOURCE: EARTH INFORMATION FROM SPACE BY REMOTE SENSING, A REPORT PREPARED FOR OSTP BY BRUNO AUGENSTEIN, WILLIS SHAPLEY AND EUGENE B. SKOLNIKOFF, JUNE 2, 1978, PP. 4-7.

system. Thus both political interests and organizational inertia are involved in this transfer, making the decision even more difficult.

Successful commercialization depends on whether there are sufficient private benefits to lead to an eventual satisfactory return on investment for a private operator, recognizing the existence of a continuing and substantial government demand for land remote sensing services. As one of its findings, the Subcommittee on Space and Applications, of the House Committee on Science and Technology, concluded that

> The greatest negative influence on the evolution of an operational civil and land remote sensing system has been the inability to fully evaluate the relationship between LANDSAT and national needs to provide a long-range policy that is continuously reflected in the budget.*

All in all, given the economic factors discussed elsewhere in this report, the past history of the LANDSAT program and the current nonfinancial issues discussed in this section, the task of designing an appropriate long-term framework for the land remote sensing system is about as challenging as one could ever find. As mentioned earlier, it is obvious that the issues raised reflect fundamental differences in political philosophy which exist in the U.S. society; the dominant philosophy at a particular time determines priorities and defines the appropriate role of government. All of these differences are the topic of continuing political debates and are unresolvable analytically. Inevitably, an eventual decision on a permanent framework for the land remote sensing is going to be a political decision in which one set of values prevails over another. This report can make a contribution to informing those participating in such debate, but it cannot substitute for the political process.

7.2 International and Foreign Policy Issues

The capability to make useful observations of all parts of the earth's land surface from orbit, using a U.S.-developed and operated satellite system, has provided a foreign policy opportunity for the United States. It has also created international demands that the United States, along with other potential operators of earth observation systems, be governed by a series of existing and emerging international obligations and principles related to remote sensing. These opportunities and obligations define an essential part of the context within which

*House Committee on Science and Technology, Civil Land Remote Sensing, op. cit., p. 4.

various scenarios related to a permanent U.S. remote sensing venture must be evaluated.

Current U.S. government policy with respect to the international aspects of remote sensing dates back to Richard Nixon's 1969 pledge before the U.N. General Assembly that "this program will be dedicated to producing information not only for the U.S. but also for the world community." In the years since, the United States has put forth, and defended strongly against criticism, a policy of open and nondiscriminatory access on the part of all countries and their citizens to the products of the LANDSAT system. The United States has taken positive steps, ranging from allowing other countries direct access to LANDSAT spacecraft with their own ground stations to providing technical assistance to countries wishing to use LANDSAT information, to implement Nixon's 1969 statement and its open access policy. Any attempts to reverse the policy, to change the expectations or to modify the patterns of use which have evolved over the past decade will be certain to create international tension.

The current state of international thinking on remote sensing, at least on the governmental level, is perhaps best reflected in the report of the 1982 Unispace Conference. That report noted that although remote sensing is still in a "preoperational" stage, "it is only a matter of time—and a short time—before this very important application attains a completely operational status." Given this reality, the report said "agreement should be reached on principles governing satellite remote sensing. Work to this effect....should be continued as a matter of priority, aimed at speedy agreement on such principles." In addition to a framework of general principles, concern was expressed that

> Satellite operators should give assurance about continuity of data flows and provide indications about estimated lifetime [of] preoperational and operational systems in order to help all countires, in particular the developing countries. Compatability of various systems and data formats is another important aspect....
>
> Since remote sensing can collect data from all countries, it is therefore possible to use shared or internationally-owned remote sensing satellites....
>
> It is suggested that a study be undertaken to assess the need for and the viability of a worldwide remote sensing system. Such a study could consider various ways of providing remote sensing data—including regional, bilateral, multilateral and international arrangements—with the users bearing therefore the development, production, launching and operation costs of the satellites. Assuming that any one of these systems could provide assurance of continuity of data formats, avoid

forced obsolescence of equipment, and enable the development and use of standardized data analysis software, the study should in particular indicate the comparative cost of such systems to the users vis-a-vis systems currently in operation and/or under development.

A persistent issue in international discussions is "a possible situation in which data are not available to the sensed State but are available for commercial and other forms of exploitation by another country." At the conference

> Some delegations expressed serious concern regarding the dissemination of data collected by remote sensing satellites. While several developed and developing countries felt that such information should be freely available to any interested State, most delegations felt that the consent of the sensed State should be required before data could be released to a third State organization or third party. Some developing nations felt that the consent of the sensed State must be obtained before sensing, even if the information was not to be disseminated beyond the concerned States; some felt that in no case should the information be available to any State other than the sensor and sensed States. Most representatives expressing an opinion on the point agreed that priority in access to data must be accorded the sensed State.*

The central points made by potential foreign users** of land remote sensing products, then, are:

- The need for continuity in operation and overall system characteristics
- The need for guaranteed access at an acceptable price with provisions to avoid intrusions on national sovereignty.

The United States has attempted to deal with these pressures from the international community in ways that maximize these U.S. policy objectives:

- Maintaining U.S. leadership in space technology
- Assisting the economic and social development of the developing countries
- Promoting international cooperation as a means of achieving common objectives and as an example of the benefits of harmonious relationships among nations
- Ensuring U.S. ability to use space technology for its own national objectives, including operation of earth observation systems by both civil and national security agencies

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*United Nations, Report of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, August 9-12, 1982, A/CONF.101/10.

**The current debate is between the United States, as the country farthest along in developing a remote sensing system, and countries without plans to develop their own systems. In general, other potential system operators, such as France and Japan, have moved to a position close to that of the United States on such issues as the need for prior consent of a sensed state.

- Enhancing the development of the U.S. economy by fostering new industries, new employment opportunities and new markets for U.S. firms.

In seeking to achieve these objectives the U.S. government has entered into a series of legal and political obligations. These include:

- The provisons of the Outer Space Treaty of 1967 which require "States party to the Treaty" to "bear international responsibility for national activities in outer space,...whether such activities are carried on by governmental agencies or by nongovernmental entities;" such non-governmental activities "require authorization and continuing supervision by the appropriate State party to the Treaty."*
- A series of agreements negotiated with other governments to permit them access under mutually agreeable terms to the output of U.S. remote sensing satellites using foreign owned and operated ground stations.
- Through our advocacy of the policy of open, nondiscriminatory access in UN forums and otherwise, a fairly explicit obligation not to create either formal or informal (such as unaffordable prices or continuing changes in technical format of the system output) barriers to any country, organization or individual who wants to use the system, with all users receiving nondiscriminatory treatment.
- Through negotiations in the International Telecommunications Union, agreement not to use the frequencies allocated for communicating remote sensing data streams to ground stations for any other purpose.

Given this melange of concerns, objectives and obligations, a few of the international issues which are suggested include:**

Future International Negotiations

Over coming years as remote sensing capabilities evolve, there are sure to be continuing international negotiations. These will take place in the United Nations, other permanent multilateral organizations, ad hoc or informal multilateral groups, or on a bilateral basis. Participation in these negotiations may vary, depending on the framework adopted for U.S. remote sensing activities. If a private sector option is selected, what international role, if any, will the private sector operator want the U.S. government to play? What role will U.S. government agencies believe is required to protect U.S public interests?

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*Treaty on Principles Covering the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, 1967, Article VI.

**This discussion treats only the distinction between a government-owned system and a privately-owned system without attention to various scenarios for private ownership. Such treatment is provided in the comparative analysis in Table 8.2

Evolution of International Principles to Govern Remote Sensing

After ten years of debate in the U.N. Committee on Peaceful Uses of Outer Space (COPUOS), there remain major differences. Prospects for consensual agreement (which is the standard practice for this committee) are dim. In a similar situation with respect to direct broadcast satellites, a majority of countries agreed to move the issue from COPUOS to the Political Committee of the General Assembly, which operates according to majority vote. The United States opposed this move, and the principles which resulted from it. Might the prospect of transfer to private sector operation stimulate a similar attempt?

Maintenance of Open Nondiscriminatory Access

The interests of a commercial operator might sometimes conflict with the long-standing U.S. policy in this area; one way of increasing the value of remote sensing products is to limit their dissemination. Another is by providing priority access to some users. The Department of Commerce Land Remote Sensing Satellite Advisory Committee recommended that there be a government requirement "that the operator, whether it be the government and/or the private sector, subscribe to the open sky policy—which primarily means that anyone, anywhere, in any countries can purchase the data at equitable prices."* The current government policy, as enunciated in President Reagan's space policy statement of July 4, 1982, is to "support the public, nondiscriminatory direct readout of data from federal civil systems to foreign ground stations and the provision of data to foreign users under specified conditons."** The policy is silent on requirements for nonfederal systems.

One way to restrict access to remote sensing data is to adopt policies which are explicitly discriminatory. Another means is to price certain data (such as "quick looks") in ways that exclude some potentially interested users. This possibility has been noted by the international community; for example, a Romanian spokesman told COPUOS this spring of his concern about "the relatively new question of considering satellite remote sensing activities as operational, on a purely commercial basis, with the immediate consequence of augmenting by

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*Department of Commerce, Minutes of the Land Remote Sensing Satellite Advisory Committee meeting, November 1982.

**The public statement of Administration space policy is contained in a White House Fact Sheet, "National Space Policy," July 4, 1982.

several times the cost of remote sensing products. Under these conditions, effective access to the data is practically possible only for developed countries."

How will considerations of cost recovery and even commercial profit interact with an open access policy as an operational system evolves? Will system products be provided to poorer countries on a subsidized basis? What are the interactions among U.S. policy objectives vis-a-vis developing countries, the economic viability of an operational system and the general concern of avoiding tensions? Although poorer countries may in the long term have the prospect of receiving the most benefits from remote sensing, who will make the investments required for them to be effective users, and thus a growing market for the system? In the short run, would more expensive products from a private commercial system drive away non-U.S. users?

Meaning of U.S. Leadership in Space Technology

Current policy is to "maintain United States space leadership," particularly in "critical aspects of space, applications and technology;" in these areas, the objectives is "preeminence."* The meaning of this policy with respect to remote sensing technology is unclear. Given the emerging foreign competition in the field, how will the U.S. government respond: by a continued program of R&D in the remote sensing area, keyed to staying ahead of competing systems; by reliance on the private sector to develop a superior system for the United States, without continuing government R&D subsidies; by providing subsidies or incentives beyond R&D to a commercial operator in order to help it best foreign competition and thus bring the benefits of a growing remote sensing industry (sales of equipment; training of non-U.S. personnel; consulting services, etc.) to the U.S. economy? Or is civil remote sensing not a "critical" area, and thus not one which requires U.S. leadership? What would be the costs, in terms of more general foreign policy or economic objectives, of a non-U.S. system dominating the world market for remote sensing? This could happen if no commercial system is established and the U.S. government withdraws from remote sensing activity after LANDSAT D' reaches the end of its lifetime, or if the U.S. commercial venture is unsuccessful.

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*The public statement of Administration space policy is contained in a White House Fact Sheet, "National Space Policy," July 4, 1982.

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Future of Non-U.S. Ground Stations

It is likely that any future U.S. remote sensing system will use a data relay satellite to return data to U.S. ground station. Thus there will be no strong requirement, from a U.S. perspective, for direct readouts to ground stations outside the United States. For a number of years, the U.S. government has permitted, even encouraged, the development of such ground stations, mainly as means of underlining U.S. policy on open access and as a symbol of friendly relationships. Other governments have entered into agreements with the United States government with respect to access to LANDSAT and have made substantial investments in ground stations and related data processing and interpretation equipment. The motivations of these countries have ranged from national prestige to a careful calculation of tangible payoffs from the use of LANDSAT data.

The role of foreign ground stations in an era of operational remote sensing systems is problematical. If cost recovery is the objective of a government system, will the access fee and royalty arrangements have to increase to levels which foreign operators will find hard to accept? Will the U.S. government provide what is in effect subsidized access to foreign operators? If a private U.S. system evolves, what changes will result in the relationship with non-U.S. entities, which negotiated their current arrangements with the U.S. government? Would some countries prefer to deal with a non-U.S. system rather than a U.S. system which is privately operated? Could non-U.S. ground stations be effective in the role of regional franchised distributors of remote sensing products, operating in a commerical context? How could any proprietary restrictions on remote sensing data, e.g., copyright, be policed and enforced when there is multiple access to the system?

Creating Dependency Relations

To date few entities (including those in the United States) are critically dependent on the availability of remote sensing data to achieve their important objectives. As the technology matures and its use becomes widespread, this situation could change. This has positive aspects from a U.S. perspective, since it would place the country in a position to exert some influence on global developments because it controlled a technological resource with global implications. There are negative aspects as well; for example, countries which depend on reliable access to U.S.-supplied remote sensing data may protest or retaliate if, for some overriding reason, the U.S. system should go out of service, charge excessively high

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prices, or provide products with degraded quality. By making remote sensing a critical tool in the common task of managing the global ecosystem, the United States takes the responsibility of long-term, high-quality performance of its earth observation systems.

This discussion of the international aspects of land remote sensing has been extensive because the international character of the system presents extremely difficult issues to those attempting to select a framework for the U.S. operational system. This is especially the case when the general foreign policy issues discussed in this section are examined together with those issues more closely related to national security concerns. The next section is such an examination.

7.3 National Security Issues

It is a matter of public record that the United States uses earth observation satellites as one of its means of gathering intelligence information with respect to other areas of the world; these satellites are assets of extremely high value to U.S national security interests. The capabilities of these satellites have also been extensively discussed,* and in most parameters they clearly exceed those available for civilian use. However, it is also reasonable to suggest that some information with intelligence significance can be extracted from existing civilian land observation satellites and that existing national security systems may not duplicate all capabilities available in civilian satellites (for example, coverage in particular spectral bands). Thus there are unavoidable national security aspects to the routine operation of a civilian land remote sensing system. In times of international tensions or crises, these aspects become more pronounced, and the U.S. government will want to ensure that its national security agencies will be able to control all earth observation systems in that situation.

Just as earth observation systems have both civilian and national security applications, the technologies on which they are based have "dual use" characteristics. Capabilities developed initially for national security purposes have potential relevance to civilian uses, and the technologies involved in sensors, data processing, image interpretation, etc. are sensitive in terms of export control regulations.

*For a discussion of the capabilities of various U.S. observation satellites, see Thomas H. Karas, The New High Ground, New York: Simon & Schuster, 1983, Ch. 4.

Given these realities, the following national security issues are suggested.

"Open Skies" Precedent and Ability to Carry Out National Security Observations

One not quite incidental fallout from the U.S. policy of open, nondiscriminatory access to the products of government earth observation systems operated for civilian purposes is the creation of a climate in which all U.S. observation satellites can function without drawing protests from the countries of the world. Any modification of an open access policy, particularly by a private operator seeking competitive advantage or increased economic return, could change this situation. For example, in the wake of the recent Administration announcement of its intent to transfer ownership and operation of civilian earth observation satellites to the private sector, one Canadian official indicated that his government was "very concerned," saying "we have a satellite looking down at our country and we don't call it a spy satellite because we have nondiscriminatory access to it. ...But if we were charged 100 times as much by some company, then we might have to begin to wonder about this."*

Tradeoffs Between National Security Interest and Economic Competiveness Concerns

Under continued government ownership and operation of the land remote sensing satellite system, past patterns of coordination between national security agencies and civilian agencies such as NASA and NOAA would likely persist. Some civilian sector objectives differ from those of the intelligence community, which has taken a conservative position on making available advanced sensor capabilities. On the whole, however, the relationship between the two sectors of the government has worked well. The potential for the transfer of the system out of government control does create serious questions regarding the extent of government supervision necessary and possible. National security-related areas in which a possible regulatory regime might engage itself include: spectral resolution, center frequency and tunable range; spatial resolution; geographic coverage; timeliness of data availability; tasking procedures and controls; and data dissemination policies.

The kind of quiet coordination which is possible within the government would be much more difficult to maintain in a relationship with a private sector entity.

* Washington Post, March 8, 1983, p. 1.

In the instance of private sector operation of the system, it becomes very important to recognize the need to temper national security considerations when designing an appropriate regulatory regime. Due regard must be given to the international market in which the private entity is operating, so that regulatory practices do not seriously erode the system's competitive position. A private operator may find, for example, that improved sensor characteristics may be required in order to keep itself economically solvent.

From the national security point of view, those sensor characteristics may present problems either in terms of revealing sensitive U.S. technological capabilities or in terms of providing images of the United States or other countries from which intelligence information could be extracted. If sensor capabilities were to be improved, then the intelligence community might want to involve itself in the process of determining appropriateness of data for dissemination.

Reaching a balance between considerations of national security on one hand, and the need to develop a high performance, economically competitive system, on the other, will continue to be a very difficult and complicated issue as land remote sensing satellite technology develops. Further aggrevating this balance is the fact that U.S. national security interests and controls are in a large part derived from a different set of motivations and values than the potential security controls which might be applied to the French, European or Japanese systems. Thus there is unlikely to be easy agreement among operators of remote sensing systems over what are acceptable limits on system performance from a national security perspective.

Export Control Regulations and Land Remote Sensing

There is heightened concern in recent years that U.S.-developed technology is being acquired by our adversaries and used as a major basis for their military capabilities.* There is also recognition that the export of products and services based on advanced technology is a major source of positive U.S. balance-of-trade. Creating an operational U.S. land observation system aimed at dominating the international market brings with it an export control issue: will the United States aggressively seek to supply all elements required for other countries to participate in such a system, e.g., ground stations, computing capability, image interpretation

*This argument is made in, for example, Department of Defense, Soviet Military Power, 1983.

capability, or will concerns over the export of sensitive or dual-use technologies limit the ability of the United States to capitalize fully on such a marketing opportunity?

National security concerns such as those embodied in the last two issues discussed above, in the context of a privately-operated system, must be addressed within the framework of whatever regulatory regime is created to oversee such a system. Such legal and regulatory issues are discussed in the following section.

7.4 Regulatory and Legal Issues

Most regulatory issues arise, almost by definition, in the case of private sector operation of a land remote sensing system. Since any private system a) carries with it the international and national security implications discussed above, b) will be based on publicly-funded research and demonstration results, and c) will be serving a large variety of government needs, it is appropriate that the government take the measures required to protect the public interest with respect to private system operation.

Conversely, a private system operator has the right to protection of its commercial interests; it should not be required to operate under conditions which prevent or inhibit success in developing a private sector remote sensing industry, and it may require various forms of government protection or assistance to develop such an industry.

Whatever kind of legal and regulatory framework is adopted at the initiation of a private sector land remote sensing venture, it must be flexible enough to evolve over time as the enterprise grows and adapts to a changing operational and competitive situation. There will also have to be a decision on how general/specific any regulatory framework should be. Most potential private sector operators would probably prefer the most general kind of regulations which are politically acceptable; given the many facets of system operation which are candidates for regulation, however, public authorities may decide that a relatively specific set of regulatory requirements will best protect the public interest.

One area of common concern, whether the system is governmentally- or privately-operated, is that of proprietary controls over data and system products. If any kind of cost recovery is a system goal, then it appears that some form of control, such as copyright, is required to prevent secondary duplication and dissemination of system products.

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The issues discussed below, then, reflect a decision to transfer land remote sensing responsibility to some form of private operator.

Protection Against Competition?

The key issue here is whether the land remote sensing enterprise is a natural monopoly, and thus deserving of government protection from damaging competition, or whether over the next few years various potential private suppliers of remote sensing services will emerge. In this latter case, the appropriate role for government is to preserve a competitive environment and to prevent undesirable monopoly control. The findings of this report suggest that, at least for each class of remote sensing products individually, only one commercial venture can be successful, and thus that the situation does indeed resemble that of a natural monopoly. It is a slightly different question, however, whether that monopoly organization should be allowed to evolve through proving itself superior to any competition over a period of time, or whether it should be established at the start through competition over the awarding of the remote sensing "franchise."

Starting with the assumption that a private monopoly of remote sensing is also in the public interest, the question then becomes: "What public assurances are required to ensure that a private venture is economically viable, with a reasonable degree of risk?" This is as much a political as an analytical question, and thus must eventually be answered in the context of the policy development and approval process.

Possible Areas for Regulation

In the discussions of this section, no distinction is made between the legal requirements which might be embodied in a contract between the government and a private sector operator and requirements which might be spelled out (either by Congress or by the designated regulatory entity based on its general authority) in the form of actual regulations and regulatory policies. In practice, however, this distinction will be important, as it is likely to be easier to modify contract requirements on the basis of experience than to change formal regulatory requirements.

Candidates for regulation include: pricing policies, conditions of service, conditions of access to system output, role of system operator in associated ventures, technical standards for various system products, requirements for coordination and complementarity with non-U.S. systems, adherence to international law and treaties, adherence to national security constraints, provisions for government

access or takeover in times of national emergency, insider use of remote sensing information, export control constraints, etc. The list is long and the requirements complex and not always consistent. The public interests involved are significant, but the danger of overregulation undermining the viability of a private venture is real. Thus decisions on the nature and degree of regulation are likely to be difficult and subject to challenge. This is another reason for a flexible regulatory approach as the system evolves.

Possible Areas for Government Assistance

Since currently the federal government acquires a large portion of the distributed information products, the fundamental assistance that the government can provide to a private operator is guaranteeing to meet government needs by purchasing remote sensing products from a single U.S. operator, rather than procuring them on a competitive basis from other U.S. or international providers. The time span of this guarantee and its specific provision will be a subject of negotiation as the private venture evolves. However, questions which will inevitably be raised include:

- Can the U.S. government pledge to purchase a specified amount of anything from a private supplier well into the future, when the funds for such purchases have not been appropriated? Or must the pledge be to purchase all of government's needs from a single supplier, without a guarantee of a minimum amount of business?
- What will happen to government purchase requirements if the private operation is successful? Is unsuccessful? In the former case, will government incur a reduced purchase obligation, or a reduction in price? Will there be any kind of profit-sharing? In the latter case, will there be "bail out" provisions which will increase the cost to government of assisting the system? What are the government's obligations to a failing system?

In addition to long-term purchases of system products, government can provide a number of other forms of legal and regulatory assistance to a private operator. These include:

- Providing copyright or other form of proprietary protection so that the private operator can control dissemination of remote sensing products; this protection would have to extend to the operation of foreign ground stations and purchases by non-U.S. uses.
- Waiving Freedom of Information Act provisions so that the government does not have to provide to the general public copies of products which the government purchases for its own needs.
- Agreeing on terms for government use of its purchases. Will several agencies be able to share a single product, or must each agency pay for its own needs?

- Providing protection from legal actions initiated by potential competitors. What will be the anti-trust context in force if the government creates and maintains over time a monopoly relationship with a single remote sensing venture?
- Helping the private operator in market development vis-a-vis, on one hand, such potential users as state and local governments and research institutions and, on the other, overseas markets which might result from U.S. government technical assistance programs or export promotion efforts.
- Protecting the U.S. operator against unfair foreign competition in third-country markets or in the nongovernment share of the U.S. market.

As the above discussion suggests, questions arising from the necessary relationship between the U.S. government and any private system operator will be persistent and multifaceted. In order to carry out the government role in this partnership, an effective institutional mechanism or mechansims must be chartered. The following section discusses this and other institutional issues.

7.5 Institutional Issues

It should be clear at this point in the discussion that any particular institutional format chosen for a land remote sensing satellite system would be derived from answers to a series of questions regarding the kind of political, international, legal/regulatory and national security implications identified above. Whether the system is government owned, quasi-governmental or privately owned by either competitive or monopolistic entities, there is no doubt that there will be vested in it such organizational devices as are deemed necessary by the government to assure that relationships between the system's operator and various public, foreign policy and national security interests are preserved. It is most likely that the organizational framework for the U.S. land remote sensing satellite system which is selected will be that which best embodies the dominant set of political, social and economic philosophies of the time, rather than a structure determined analytically to be optimum.

Therefore, detailed attention is not paid in this section to an analysis of a variety of organizational alternatives. This is simply because institutional issues appear to be somewhat secondary when compared to other nonfinancial issues. Given an agreement within Congress and the Executive Branch on what political, social and economic parameters should guide the establishment of the system, there is little doubt that a viable framework for the operational land remote sensing system can be designed. A historical example of such organizational

innovation was the creation of the Communications Satellite Corporation (COMSAT). Once majority agreement was reached during the economic and political debate which occurred in the summer of 1962 over the appropriate framework for commercializing communication satellites, it was possible to design an innovative organizational form which was satisfactory to most of the participants in the debate. There is no reason to think that in the case of the land remote sensing satellite system the situation will be any different. Much of the controversy over various organizational forms in the case of both COMSAT and now land remote sensing, it appears, has actually been as a surrogate for debate over more fundamental issues of economic and political philosophy.

There are several comments which can be made with respect to institutional aspects of the remote sensing issue. One is that the structure of the federal government has proved ill-matched to the task of developing and demonstrating a system which would lead to commercialization. A R&D agency, NASA, was responsible for the early stages of the U.S. land remote sensing program, and its actions in retrospect appear driven as much by considerations of engineering development as by those of user requirements and market opportunities. The interim government operator of the system, NOAA, has had little opportunity to demonstrate whether it can be successful in creating a more user-oriented, operational style for the LANDSAT program. Many different federal agencies, particularly Argiculture, Interior and the Central Intelligence Agency, are users of remote sensing data, but they have differing needs and priorities vis-a-vis remote sensing, and none seem willing to make long-term commitments to data purchases and to using the output of the system in ways critical to their respective missions. This may be partly due to the lack of guarantee of continuity of service. A major argument against keeping remote sensing within a governmental framework (in addition to economic and political factors) is the limited evidence to date that this will result in a successful U.S. system in the long run.

A second set of institutional issues relates to the government's role vis-a-vis any privately operated system. According to current policy,* the Department of Commerce (specifically, it would seem NOAA/NESDIS) will have responsibility for aggregating government requirements, specifying the conditions under which a private system will operate, and developing and implementing the regulatory

*White House Fact Sheet, "National Space Policy."

framework for the system using the authority provided by Congress as part of the legislation transferring the operating franchise to a private entity. The point here is that NOAA has limited experience in any of these roles, and some sort of institutional and staff modifications are likely to be necessary to provide the capabilities required.

7.6 General Policy Issues

This review of the various categories of nonfinancial issues has led to the identification of several major policy concerns related to the viability of the remote sensing venture; to the R&D requirements for the future success and continuity of the system; and to the balance between public, governmental and private interests.

In determining the appropriate institutional location for the permanent system, decisions must be made as to the extent of responsibility that the government will assume. For example, under continued government ownership and operation, commitments must be made to uses which may necessitate re-examination of long-term budgetary requirements for affected agencies. Under private sector control, criteria need to be set which will outline the extent of the financial obligations the government may have with the private sector entity, including provisions for possible failure of the system due to successful competitive pressure or to general lack of demand for its products. For example, will government be asked to nationalize a failing venture because of its importance to national and societal interests, as well as to private interests? When a private venture is threatened by economic competition from overseas systems, will the government adopt protectionist policies? Will the government's positive role include expanding international markets? What steps and policy requirements would be required in the case of technical failure of the system? How much redundancy in the system will be required of a private operator, or even a government-operated system, in order to assure data continuity? Will government retain the right to step in and launch its own satellites or to assume some sort of managerial control over the private venture in the event of failure, economic or technical, of the private sector operator?

It is assumed that research on advanced remote sensing technology will continue to be carried out under government auspices, either through an active civilian R&D program or in the context of meeting national security requirements.

Yet the extent and conditions for transfer of such government-developed technologies to a privately operated system is unclear. Government has not yet made an explicit commitment to continue R&D on sensor and processing technologies if operation of the land remote sensing system is in commercial hands. In the case of communications satellites, the United States withdrew from R&D in related technologies in the early 1970s on the grounds that since the private sector was operating communications satellites, they should also be responsible for the R&D required for future systems. This policy was reversed under the Carter Administration, and NASA in recent years has resumed its communications satellite R&D efforts. The grounds given for this policy reversal was that the private sector was not doing the basic work required to keep the U.S. competitive vis-a-vis other industrial countries.

This suggests that a program of continued government R&D cannot, in fact, be assumed; NASA priorities may well point elsewhere. Other problems likely to characterize any continued relationship between government and a private sector operator in the area of R&D pertain to how decisions on the R&D are to be made and by whom. For instance, who is to determine what areas of R&D are most important and who is to say when a new technology is "operational?" Also, what restrictions are to be placed upon use within government of products resulting from R&D efforts, since potentially these could undercut the government market for existing remote sensing imagery.

Of overriding importance is the recognition that there are both public and private interests in land remote sensing and that the two do not necessarily always coincide. It is important in assessing alternative systems to pay proper attention to determining the appropriate balance between public and private interests. This balance must be not only achieved prior to transfer, but should also be assessed throughout the subsequent life of the system.

In deciding on a strategy appropriate for transfer to private operation, it is important to keep in mind the fact that the public has invested well over a billion dollars in the development of this capability to date. There are certain expectations, irrespective of recoupment considerations, about the continued responsiveness of the system to public interests. These expectations will persist whether the system is handed over to a monopoly, to competitive enterprise or is designed in the formation of a public corporation. Numerous political difficulties and conflicts might arise if transfer to a private operator is attempted without some form of

meaningful competition. One reason for this lies with basic problems in designing a regulatory entity which is effective in its performance of its public responsibilities and assigned duties. If transfer is through a noncompetitive, sole-source award, problems may develop as a result of the "captivity" that sometimes occurs when a single body functions as both user and regulator of the activities of an industry.

On the other hand, the interests of any private sector operator of remote sensing must also be protected. Various foreign policy, international, national security or domestic interest must be addressed, yet regulations should be tempered by concerns of commercial viability and economic stimulation. Care must be taken to ensure that the private entity is not overregulated and is able to operate over time in an efficient and profitable manner.

7.7 Policy Requirements - A Summary

Whatever scenario is followed for creating a permanent operational framework for the U.S. remote sensing system, it seems that government policy dealing with the following must be developed by the cooperative efforts of Congress and the Executive Branch:

- Providing for system continuity (or of ways of dealing with discontinuities) - Full potential of remote sensing applications and markets will never be achieved unless users can depend on having the kind of system output they need available when they need it.
- Setting data policy - Although the substance of a data policy may differ depending on the overall framework selected, the government will have to decide what kind of influence it wishes to exert on parameters such as price of system products, conditions of access to those products and technical standards for system performance.
- Relating a U.S. system to other systems, to non-U.S. users, and to international political and legal factors - There is an inescapable international dimension involving cooperation, coordination and competition to any remote sensing enterprise. How international aspects will be integrated into system operation will remain a continuing policy challenge.
- Developing a regulatory framework for system operation - Any system operator will have to manage a remote sensing enterprise within limits and requirements set by government. That framework should reflect balanced agreement with respect to a variety of conflicting national goals, objectives and interests relevant to remote sensing activities.

Reaching agreement on such a policy framework, given other financial and nonfinancial issues reviewed so far in this report, will require creative policy making and a willingness to compromise, negotiate and "satisfice" with respect to the many private sector and public sector interests connected to remote sensing.

The previous sections of this report reviewed several scenarios for setting up a permanent framework, with an eye to determining whether one or another of these scenarios is more likely to facilitate the needed agreement. As has been said several times in this section, many of the choices to be made are choices between conflicting goals and values, and thus are the kind of choices best made for society through its legitimate political authorities.

8. OBSERVATIONS/CONCLUSIONS

Benefit and cost effectiveness studies performed over the past decade have concluded that the potential benefits from a LANDSAT system would be on the order of hundreds of millions to a billion dollars annually [26-29]. With these large potential benefits an obvious question is why has commercialization not taken place? A likely answer to this question is that a public sector undertaking, such as the LANDSAT program, can be justified if it can be shown that the potential benefits from the program exceed program costs. The benefits are to the public at large and there need not be a convenient mechanism for charging for benefits provided. The public sector's objective is to maximize societal benefits. A private sector business venture may provide the same public benefits but the benefits of concern are those obtained by the business venture in the form of profits. The private sector objective is profit maximization.

It is very often the case that the objectives of profit maximization and benefit maximization do not coincide. This is normally the case when there is a lack of pricing mechanisms that relate to benefits. To illustrate, consider a system that improves emergency communications in rural areas. Studies have shown that this could lead to thousands of lives saved annually having economic value to society of hundreds of millions to billions of dollars. However, commercialization is not likely to occur specifically for this application because there does not appear to be a pricing mechanism that can be related to the value of lives saved.

For a business to achieve a profit requires revenue which in turn implies a pricing mechanism. Unfortunately, many of the potential benefits from land remote sensing have not been linked by a pricing mechanism; in other words they are a public good. To date it appears that pricing mechanisms have only been established based upon budgets that have been developed over time for providing a service (for example. obtaining imagery that will assist in the location of mineral deposits, and collecting wheat yield data and producing crop forecasts)—the value of LANDSAT data has basically been equated with the cost of collecting similar data by other means. Generally, budgets have not been increased because of the "added capability" or added value of the information products to society. Thus the markets to date for LANDSAT type products have been related to existing data collection budgets. New or increased markets will only develop as an appreciation

develops for the added capability and added value of the LANDSAT type products. When budgets are not increased to the point where net benefits are maximized through private sector actions, government participation through ownership and operation or subsidization may be appropriate in order to achieve the societal benefits that might otherwise be foregone.

The observations and conclusions that may be drawn from the analyses reported in the previous pages have been grouped into the categories of Operations, Financial and Nonfinancial. These are discussed below.

8.1 Observations/Conclusions: Operations

LANDSAT D is currently providing land observation data. It has a finite life—possibly three years. When D fails it will be replaced with D'—this is not a certainty since launch reliability is not 100 percent. If D' is placed into orbit successfully it is likely to last two to three years. If action is not taken swiftly, it is likely that both D and D' will have failed before a replacement is possible. This series of events, coupled with the expected competitive SPOT and other systems and the need for uninterrupted service, poses a dilemma.

First the need for uninterrupted service. Certain users (both U.S. and foreign) have come to rely on LANDSAT information products. An interruption in service may cause these users to revert back to pre-LANDSAT operations or to seek similar data from other sources, for example SPOT. Since the market (assuming uninterrupted service) for LANDSAT products is anticipated to be insufficient for commercialization, government support will be required to achieve a goal of commercialization. Therefore a loss of any piece of the market (because of an interruption in service) can be significant and would have to be made up by additional government support.

The dilemma is that the anticipated sequence of events dictates that rapid decisions be made with respect to commercialization or retention. Insufficient information currently exists upon which to make the necessary informed decisions. Because of the magnitude of the costs and expenditures and procurement times associated with remote sensing, inappropriate decisions may not be reversed for a decade or more. On the other hand, informed decisions imply time delays while the necessary information is obtained upon which to base these decisions. Delays increase the likelihood of service interruption. Therefore, informed decisions imply the need for an additional spacecraft to backup LANDSAT D'. This must be

initiated immediately if there is to be a high likelihood of continuity of service. It should be noted that doing nothing implies either phase-out or interruption in service—both are good for competitive systems.

The inability to be specific about launch vehicle cost is a contribution to the uncertainty surrounding a possible commercial venture. NASA has not established definitive plans with respect to the support of the DELTA launch vehicle beyond FY 86. Commercialization of the DELTA and other expendable launch vehicles is uncertain. Shuttle pricing policy for WTR launches has not yet been established. Ariane is a possible alternative. This uncertainty with respect to the availability and cost of launch vehicles will affect private sector investment decisions.

8.2 Observations/Conclusions: Financial

There are many possible business systems that may be considered as commercialization of the civil land remote sensing program. These range from short duration flights of Space Shuttle launched instruments with marketing and sale of collected data, to a combined land and weather remote sensing operational system with marketing and sale of information and value added products. Because of time constraints only one business system was considered in this study and this was not necessarily the best. The specific business system was based upon providing uninterrupted service resulting from the continued use of LANDSAT D and D' phasing in, slightly before the demise of D', new satellites with 80M and later 30M sensors having stereoscopic capability. The following commercialization or retention options were evaluated and compared under the above business system:

- Continued ownership and operation by the federal government (planned phase-out)
- Continued ownership and operation by the federal government (establishment of the necessary budgetary line items)
- Wholly privately-owned and operated by an entity competitively selected
- Phased private ownership (government ownership and operation with private sector marketing)
- Legislatively-chartered, privately-owned corporation.

The analysis of these scenarios was developed based upon the same demand forecast and the same schedule of events. Government net cash flows were developed in all cases. For the private sector scenarios, financially viable business

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- Legislatively-chartered, privately-owned corporation.

The analysis of these scenarios was developed based upon the same demand forecast and the same schedule of events. Government net cash flows were developed in all cases. For the private sector scenarios, financially viable business

ventures were developed based upon achieving return on capital and other financial measures deemed necessary to achieve financing. The required rates of return were obtained through the use of government subsidies.

Underlying all of the commercialization or retention scenarios is a market or demand forecast that is characterized by great uncertainty. This is due to an insufficient understanding of the relationship of demand to information product attributes such as price, resolution, and number and location of spectral bands. Government actions with respect towards emphasizing or encouraging the use of land remote sensing information may significantly influence demand. This is extremely important since there appears (for the business scenario considered) to be insufficient demand for commercialization to take place without significant government involvement through ownership and operation, subsidization or a combination of both.

A basic decision that has to be made is whether or not the government will continue to participate through ownership and operation and/or subsidization or will withdraw from the remote sensing scene. Withdrawal implies a continuing cost either through the acquisition of information products or through benefits foregone. Withdrawal decreases the likelihood of commercialization which in turn is likely to result in price increases from SPOT or other systems through reduced competition. Government withdrawal (Phase-out) can be the lowest cost alternative if potential benefits are not significantly larger than costs and the cost of information products does not rise significantly.

Figure 8.1 summarizes the present value of government cash flow and average annual government cost associated with each of the considered commercialization or retention scenarios. The cash flow and costs take into account government expenditures such as payments for information products, operations costs, R&D cost, subsidy payments and equity purchases. These may be offset by receipts (from the private sector) in the form of lease payments, asset recoupment payments, TDRSS fees, profit sharing or royalty on sales, generated tax revenue and dividends. It is clear, for the business scenario considered, that government phase-out can be the lowest cost (from a direct budgetary point of view, not necessarily from a benefits point of view) alternative. When considering continuation of LANDSAT, the continued government ownership and operation scenario results in the lowest cost approach. The government costs increase, though not at

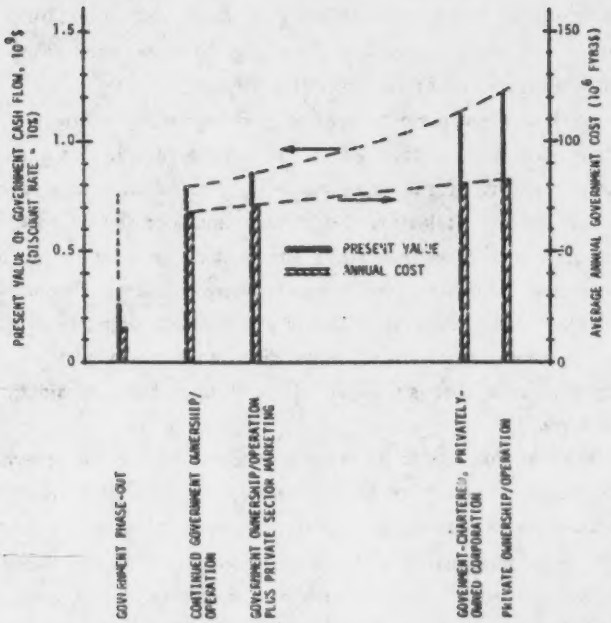

FIGURE 8.1 PRESENT VALUE OF GOVERNMENT CASH FLOW AND GOVERNMENT AVERAGE ANNUAL COST AS A FUNCTION OF COMMERCIALIZATION OR RETENTION SCENARIO (FULL GOVERNMENT RECOUPMENT)

what might be considered a significant rate, as private sector involvement increases and government operational involvement decreases. It should be noted that if private sector operations can be conducted more efficiently than similar government operations then the indicated costs would be reduced as private sector involvement increased (i.e., the slope of the dashed lines decreases and the lines pivot about the continued government ownership/operation costs). It should also be noted that, in general, as the private sector involvement increases so does the significance and complexity of nonfinancial issues.

Government costs associated with continuation of land remote sensing, are anticipated to vary only slightly with the commercialization or retention scenarios. It is anticipated that government annual costs will average on the order of $70 to $80 million (FY83$) through, and possibly beyond, 1994. The effect of asset

transfer and recoupment policy appears to be minimal. For example, for the private ownership and operation scenario, the present value of government costs is $1200 million with full repayment (recoupment) for government assets utilized by the private sector vs. $1193 million with no recoupment. Average annual government cost (constant FY83$) is $82 million with recoupment vs. $81 million without recoupment. The effect of return on equity and cost of borrowing is somewhat more significant though not a major factor. Reducing required return on equity and the cost of borrowing by approximately 20 percent (from return on equity of 17 percent and cost of borrowing of 11 percent to 14 percent and 9 percent respectively) reduces average annual government cost from $82 million to $75 million (constant FY83$) for the private ownership and operation scenario.

Based upon the financial results, it is possible to make a plausible case that full transfer to the private sector with the expectation of a viable, self-sustaining enterprise is premature by a number of years. Thus, if it is desired to continue land remote sensing then it is possible to argue that either

- There is a justification for unusual degree of government support for transfer recognizing the high value of land remote sensing information products, the possible lack of pricing mechanisms that reflect this value and the resulting high risk character of transfer to the private sector, or
- There is a need for continuing government leadership in this area with a limited but possibly gradually increasing private sector role.

In addition to examining government costs, the alternatives to government retention were studied from the perspective of a potential private sector investor. In order to attain an acceptable rate of return, the alternatives to government retention involve either significant subsidy, or if the private sector takes on the marketing function, continued government ownership and operation of the space and ground segments. Of the private sector options considered, the latter appears to be the most attractive from the standpoint of financing (size of investment); however, all of the options to government retention share a complex set of nonfinancial problems. On the other hand, should the government choose to phase-out LANDSAT operations, from a purely financial standpoint, it is not likely that the private sector in the U.S. will step in and provide the same services that are currently furnished by the federal government without some form of subsidy.

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TABLE 8.1 NONFINANCIAL ISSUES: COMPARATIVE ANALYSIS

CATEGORY OF ISSUE \ SCENARIO	GOVERNMENT OWNERSHIP		PHASED-IN PRIVATE OWNERSHIP
	CONTINUATION	TERMINATION	
INTERNATIONAL AND FOREIGN POLICY	• BUILDS ON ESTABLISHED PATTERNS OF INTERACTION, CURRENT POLICY OF OPEN ACCESS, AND AGREEMENTS WITH FOREIGN OPERATORS OF GROUND STATIONS • FACILITATES USE OF REMOTE SENSING TECHNOLOGY AS INSTRUMENT OF FOREIGN POLICY • EASIER TO COORDINATE FOREIGN POLICY ACTIVITIES WITH OPERATIONAL CONCERNS • LEAST LIKELY TO PROVOKE INTERNATIONAL POLITICAL REACTIONS AND RESULTANT CONFLICT • U.S. POSITION VIS-A-VIS COMPETING SYSTEMS DETERMINED THROUGH FEDERAL BUDGET PROCESS • MAY GIVE U.S. POLITICAL LEVERAGE IN FUTURE	• FORFEITS TO OTHERS, PARTICULARLY NON-U.S. OPERATORS, ANY POLITICAL BENEFITS WHICH MAY RESULT FROM SYSTEM OPERATION • TEMPORARY NEGATIVE REACTIONS AS U.S. GOVERNMENT WITHDRAWS FROM EARLIER COMMITMENTS (E.G., TO GROUND STATION OPERATORS) AND PATTERNS OF ACTION (E.G., FOREIGN ASSISTANCE PROGRAMS BASED ON REMOTE SENSING DATA) • DIMINISHES U.S. LEVERAGE IN INTERNATIONAL DEBATE OVER REMOTE SENSING PRINCIPLES • RIDS U.S. OF POTENTIAL POLITICAL LIABILITY IF PROTESTS OVER SENSING WITHOUT CONSENT INCREASE	• MOST AREAS WITH INTERNATIONAL SENSITIVITY STILL UNDER GOVERNMENT CONTROL; GOVERNMENT COULD TAKE LEAD IN INTERNATIONAL NEGOTIATIONS • MAY CREATE OVERSEAS MARKET FOR U.S. PRIVATE SECTOR IN BOTH DATA PROCESSING AND DISSEMINATION AND "VALUE-ADDED" SERVICES • COULD COMPLICATE RELATIONSHIPS WITH FOREIGN GROUND STATION OPERATORS • POSSIBLE TENSIONS BETWEEN OPEN ACCESS DATA POLICY AND OBJECTIVES OF PRIVATE SECTOR MARKETING ORGANIZATION • GOVERNMENT COULD DETERMINE LEVEL OF INVESTMENT NEEDED TO MAINTAIN U.S. LEADERSHIP IN REMOTE SENSING TECHNOLOGY
NATIONAL SECURITY	• FACILITATES NATIONAL SECURITY INPUT INTO SYSTEM OPERATION AND EVOLUTION • MAINTAINS SEPARATION BETWEEN CIVILIAN AND NATIONAL SECURITY EARTH OBSERVATION PROGRAMS • MAY INHIBIT SYSTEM DEVELOPMENT BECAUSE OF NATIONAL SECURITY CONSTRAINTS • EASIER TO DEAL WITH CONFLICTS BETWEEN EXPORT CONTROL AND SYSTEM DEVELOPMENT OBJECTIVES	• REMOVES "COVER" OF OPEN CIVILIAN PROGRAM FOR OPERATION OF NATIONAL SECURITY OBSERVATION SYSTEM • LESSENS LIKELIHOOD OF LEAKAGE OF SENSITIVE INFORMATION/TECHNOLOGY THROUGH CIVILIAN CHANNELS • REMOVES ONE SOURCE OF POTENTIALLY USEFUL DATA FOR NATIONAL SECURITY AGENCIES	• LIKELY TO MAINTAIN NATIONAL SECURITY BENEFITS OF "OPEN SKIES" POLICY • GOVERNMENT CAN CONTROL THOSE ASPECTS OF SYSTEM TECHNOLOGY AND OPERATION MOST SENSITIVE FROM NATIONAL SECURITY PERSPECTIVE • GOVERNMENT NEEDS RELATED TO NATIONAL SECURITY COULD BE FULFILLED WITHOUT PRIVATE SECTOR INVOLVEMENT • SOME TENSIONS BETWEEN CONSTRAINTS ON SYSTEM EVOLUTION AND ECONOMIC COMPETITIVENESS OBJECTIVES
LEGAL/REGULATORY	• WILL REQUIRE SOME FORM OF PROPRIETARY CONTROL OVER DATA PRODUCTS, IF COST RECOVERY IS A GOAL • NO REGULATORY MECHANISM REQUIRED SINCE SYSTEM IS OPERATED WITHIN GOVERNMENT ACCORDING TO ESTABLISHED POLICY	• WILL REQUIRE NEGOTIATED PHASE-OUT OF EXISTING CONTRACTS AND INTERNATIONAL AGREEMENTS	• REQUIRES COMPLEX AND UNPRECEDENTED LEGAL RELATIONSHIP BETWEEN GOVERNMENT AND PRIVATE SECTOR ENTITY AS PARTNERS IN PROFIT-SHARING VENTURE • PROPRIETARY RESTRICTIONS ON SYSTEM OUTPUT MAY BE REQUIRED; DOES MARKETING ORGANIZATION HAVE EXCLUSIVE ACCESS? • COPYRIGHT OR OTHER PROPRIETARY CONTROLS ON PROCESSED DATA PRODUCTS AS WELL AS "VALUE ADDED" PRODUCTS • LESS OVERALL REGULATION REQUIRED THAN IN OTHER PRIVATE SECTOR SCENARIOS • WILL MARKETING ORGANIZATION BE EXCLUDED FROM "VALUE ADDED" BUSINESS?
INSTITUTIONAL	• WILL REQUIRE LARGER CIVIL SERVICE CADRE THAN OTHER SCENARIOS • REMOTE SENSING CAPABILITIES NOT GOOD TO FIT TO STRUCTURE OF GOVERNMENT AGENCIES, CONSTANT NEED FOR INTERAGENCY COORDINATION • RECORD OF FEDERAL OPERATION TO DATE NOT EXCELLENT, BUT NOAA A NEWCOMER TO MIX	• REDUCES CIVIL SERVICE WORK FORCE AND GOVERNMENT R&D AND SYSTEM OPERATING BUDGETS—WILL STILL REQUIRE BUDGET FOR PURCHASE OF INFORMATION FROM NONGOVERNMENT SUPPLIER, UNLESS FEDERAL USERS STOP ALL USES OF DATA ACQUIRED BY REMOTE SENSING; THEN BENEFITS (INCLUDING NONFINANCIAL ONES) ARE "OVERDONE"	• WILL RESULT IN SOME DECREASE IN CIVIL SERVICE WORK FORCE AND COULD RESULT IN MEANINGFUL NET BUDGET SAVINGS • LITTLE PRECEDENT IN STRUCTURING RELATIONSHIP BETWEEN GOVERNMENT-OPERATED SYSTEM AND PRIVATE SECTOR MARKETING ORGANIZATION
GENERAL POLICY/ POLITICAL	• REFLECTS DECISION THAT SYSTEM BENEFITS ARE PRIMARILY PUBLIC GOODS AND THUS PROPERLY PROVIDED BY GOVERNMENT • NOT ENOUGH INFORMATION AVAILABLE TO EVALUATE LIKELY IMPACT OF TRANSFER TO PRIVATE SECTOR • WILL REQUIRE LONG-TERM COMMITMENTS ON PART OF SEVERAL AGENCIES IF SYSTEM CONTINUITY IS TO BE ACHIEVED • PRESUMES CONTINUING GOVERNMENT R&D PROGRAM	• REFLECTS FAILURE OF GOVERNMENT R&D AND DEMONSTRATION EFFORTS LASTING ALMOST TWO DECADES; THIS HAS POLITICAL COSTS	• ENHANCES CHANCE OF COMMERCIAL SUCCESS BY KEEPING HIGH COST ELEMENTS WITHIN GOVERNMENT • IMPLIES CONTINUING GOVERNMENT R&D PROGRAM; WHAT R&D WOULD PRIVATE ORGANIZATION DO? • GOVERNMENT GUARANTEES CONTINUITY, SYSTEM PERFORMANCE, ETC.; PRIVATE SECTOR ORGANIZATION PROFITS FROM THEM—IS THIS POLITICALLY ACCEPTABLE? • PRIVATE SECTOR GUARANTEES A MINIMUM PAYMENT TO GOVERNMENT

TABLE 8.1 NONFINANCIAL ISSUES: COMPARATIVE ANALYSIS (CONTINUED)

CATEGORY OF ISSUE / SCENARIO	COMPETITIVELY-SELECTED PRIVATE OPERATOR	GOVERNMENT-CHARTERED PRIVATELY-OWNED CORPORATION
INTERNATIONAL AND FOREIGN POLICY	• REDUCES OPPORTUNITY TO PURSUE FOREIGN POLICY OBJECTIVES THROUGH REMOTE SENSING PROGRAM • LIKELY, AT LEAST DURING TRANSITION FROM GOVERNMENT SYSTEM, TO PRODUCE TENSIONS AND COMPLAINTS FROM FOREIGN COUNTRIES OVER PRIVATE CONTROL OF THIS KIND OF CAPABILITY • MAKES PRIVATE SECTOR ORGANIZATION RESPONSIBLE FOR HONORING U.S. GOVERNMENT PLEDGES, E.G., OPEN, NONDISCRIMINATORY ACCESS • RELATIONSHIP WITH FOREIGN GROUND STATIONS RENEGOTIATED IN CHANGED CONTEXT • U.S. GOVERNMENT SUPERVISION REQUIRED FOR ADHERENCE TO INTERNATIONAL TREATIES AND OTHER OBLIGATIONS • U.S. GOVERNMENT MAY STILL HAVE TO NEGOTIATE INTERNATIONAL FRAMEWORK FOR SYSTEM OPERATION • U.S. LEADERSHIP DEPENDENT ON PRIVATE SECTOR PERFORMANCE	• CLOSER LINK TO U.S. GOVERNMENT INTERESTS CAN BE DESIGNED INTO ORGANIZATION FROM START; THIS MAY LESSEN BUT NOT ELIMINATE CONFLICTS BETWEEN FOREIGN POLICY INTERESTS AND COMMERCIAL INTERESTS • OTHERWISE, MUCH THE SAME AS COMPETITIVELY-SELECTED OPERATOR
NATIONAL SECURITY	• CONTINUING TENSIONS BETWEEN NATIONAL SECURITY CONSTRAINTS AND OBJECTIVES OF COMMERCIAL SUCCESS • MAY MAKE IT MORE DIFFICULT FOR U.S. GOVERNMENT TO OPERATE CLASSIFIED OBSERVATION SYSTEMS • PRIVATE OPERATOR LESS RESPONSIVE TO NATIONAL SECURITY INTERESTS, NEEDS	• RESPONSIVENESS OF ORGANIZATION TO NATIONAL SECURITY REQUIREMENTS MAY BE GREATER, AT LEAST INITIALLY • OTHERWISE, MUCH THE SAME AS COMPETITIVELY-SELECTED OPERATOR
LEGAL/REGULATORY	• WILL REQUIRE SIGNIFICANT OVERSIGHT IF PUBLIC INTEREST IS TO BE MAINTAINED AS HIGH PRIORITY IN SYSTEM OPERATION • DIFFICULT TO DESIGN CONTRACT PROVISIONS ACCEPTABLE TO BOTH PRIVATE SECTOR OPERATOR AND POLITICAL AUTHORITIES • DIFFICULT ISSUES OF ANTI-TRUST, GOVERNMENT PROTECTION OF A MONOPOLY, TREATMENT OF POTENTIAL COMPETITORS • NEED TO DETERMINE GOALS AND DETAILS OF REGULATORY FRAMEWORK—MINIMAL OR SUBSTANTIAL REGULATION? • NEED FOR REGULATORY FLEXIBILITY AS PRIVATE SYSTEM EVOLVES • CHARACTER OF GOVERNMENT ASSISTANCE/SUBSIDY AND ITS LEGAL CHARACTER DIFFICULT TO ESTABLISH	• SOME ASPECTS OF REGULATORY FRAMEWORK CAN BE MADE PART OF ORGANIZATION'S CHARTER; STATUS AS DESIGNATED ENTITY IMPLIES CLOSER RELATIONSHIP TO PUBLIC INTERESTS • STATUS VIS-A-VIS POSSIBLE COMPETITION CAN BE SETTLED AT TIME ORGANIZATION IS CHARTERED • EASIER TO CREATE AND MAINTAIN EFFECTIVE GOVERNMENT-PRIVATE SECTOR PARTNERSHIP
INSTITUTIONAL	• NET DECREASE IN CIVIL SERVICE WORK FORCE, BUT NEED TO CREATE AND STAFF A REGULATORY OFFICE • CONTRACT NEGOTIATION AND MONITORING A CONTINUING TASK, AS IS AGGREGATING FEDERAL PURCHASES	• NET DECREASE IN CIVIL SERVICE WORK FORCE, BUT SOME CONTINUING GOVERNMENT INVOLVEMENT IN OVERSIGHT OF OPERATION • WILL REQUIRE ORGANIZATIONAL CREATIVITY TO DESIGN SUCCESSFUL AND POLITICALLY ACCEPTABLE STRUCTURE, SINCE MANY VALUE CONFLICTS MUST BE RESOLVED IN THAT DESIGN
GENERAL POLICY/ POLITICAL	• REFLECTS DECISION THAT SYSTEM BENEFITS, WHILE MIXED, HAVE ENOUGH PRIVATE GOODS CHARACTERISTICS TO EVENTUALLY BE BASIS FOR COMMERCIALLY VIABLE ENTERPRISE; OR, IMPACT IN TRANSFER OF PUBLIC FUNCTION TO PRIVATE OPERATOR • REQUIREMENTS FOR VIABLE ENTERPRISE INVOLVE LONG-TERM GOVERNMENT COMMITMENTS WHICH MAY BE POLITICALLY FRAGILE • MAJOR BENEFIT COULD BE STIMULATION OF NEW AREA OF SERVICE INDUSTRY GROWTH • CONTINUING GOVERNMENT R&D PROGRAM APPEARS REQUIRED TO MAINTAIN U.S. LEADERSHIP • POSSIBILITY OF "ECONOMICAL OR COMMERCIAL FAILURE WOULD RAISE DIFFICULT ISSUES; WILL THERE BE A GOVERNMENT "BAIL OUT" POLICY?	• APPROACH SIMILAR TO CREATION OF COMSAT, BUT IN MUCH MORE DIFFICULT CONTEXT; NO ASSURANCE THAT IT IS POSSIBLE TO IDENTIFY BEST FRAMEWORK A PRIORI • WILL REQUIRE CONTINUING GOVERNMENT R&D PROGRAM AND GREATER GOVERNMENT GUARANTEES THAN IF COMPETITIVE SELECTION MADE • OTHERWISE, MUCH THE SAME AS COMPETITIVELY-SELECTED OPERATOR

8.3 Observations/Conclusions: Nonfinancial

The many nonfinancial issues assume differing degrees of importance or significance for each of the commercialization or retention scenarios. These are summarized in Table 8.1.

Major nonfinancial issues are related to international, foreign policy and national security factors. Earth observation is a particularly sensitive activity internationally because nations take the concept of sovereignty seriously. Information obtained on national resources is recognized as increasingly valuable. All of this implies that any framework selected for commercialization should include maximum assurance that no international conflicts will be created and no U.S. security or foreign policy interests unnecessarily compromised. Thus, any private system will need fairly close government oversight with respect to its international aspects. Otherwise, significant potential exists for international problems.

The history of earth observation as government-developed technology and mixed public good/private good character of benefits from remote sensing combine to make transition to successful nongovernmental framework for operation particularly difficult. Requirements for commercial success may include politically fragile government guarantees and policy actions. Thus, maximum flexibility to revise public/private relationship and conditions under which system operator functions should be retained in designing the initial framework for the system.

9. RECOMMENDATIONS

The following recommendations are presented based upon the premise that commercialization issues will persist.

Because of the importance of decisions relating to commercialization, and the compressed timeframe* for making these decisions which have long-term implications, it is recommended that a number of actions be immediately initiated so that informed decisions can be made. It should be noted that initiation (by the government) of procurement of another LANDSAT satellite (beyond D') would extend the window available for making the critical commercialization decisions and allow more time for insuring that correct decisions are made.

It is recommended that analyses of the mechanisms of carrying out the transfer of remote sensing systems to the private sector continue. Specifically, it is recommended that:

- An in-depth quantitative market analysis be undertaken that will lead to definitive market forecasts and provide an understanding of demand relative to information product price, resolution, number and location of spectral bands and other important product attributes.

It is also recommended that the analysis techniques reported herein be used to:

- Continue the analysis and evaluation of other scenarios for commercialization of civil land remote sensing systems and to consider the impact of other market forecasts
- Analyze and evaluate potential value-added business scenarios and to develop an understanding of their impact on and inclusion in commercialization scenarios
- Analyze and evaluate scenarios for the commercialization of the meteorological remote sensing system
- Analyze and evaluate scenarios for the commercialization of a combined civil land remote sensing system and a meteorological remote sensing system.

It is also recommended that, in anticipation of the need to competitively select a commercialization alternative, evaluation criteria be developed against which commercialization proposals may be evaluated and then compared on

*Driven by the timing of anticipated events such as the launch, operation and demise (after several years, if everything goes according to plan) of LANDSAT D' and the time required to acquire another LANDSAT satellite and have it available for launch as a backup to D'.

a common basis. The selection of criteria can have a significant effect on which alternative will be selected. Such criteria as minimization of government subsidies and maximization of societal benefits should be considered—these will most likely lead to the selection of significantly different alternatives. As part of this effort, sufficient analyses should be undertaken so that typical scenarios are developed in response to different postulated evaluation criteria.

Since it is likely that there is room for only one system for each major product class, and the selection of the "wrong" system may eliminate the possibility for a decade or more of achieving the "right" system, it is also recommended that an analysis be performed of the impact that near-term decisions may have on long-term options.

Finally, since the analysis and evaluation of proposals for commercialization will lead to the selection of a desired alternative, it is recommended that an in-depth analysis be performed of each proposed alternative to establish estimates of the likelihood of success (both technical and economic) since failure will at a minimum necessitate a government bail out, a discontinuity in service or, in the worst case, the total elimination of the service.

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APPENDIX A
ANALYSIS OF SATELLITE AND LAUNCH REQUIREMENTS

Satellite and launch requirements are determined by the demand for operational on-orbit sensors, the number of previous successful launches and the number of sensors that have failed due to random and wearout phenomena. Since failures occur randomly, the number of launch attempts as a function of time is not known deterministically, but must be described in terms of a probability distribution.

A simulation model* has been developed to assist with the programmatic evaluation of alternative approaches to establishing and maintaining a specific desired mix of operational sensors on spacecraft in geocentric orbit. The program enables the assessment of the effects of operational requirements and reliability (spacecraft support subsystems, sensors and transportation systems) on the time-phased costs of alternative approaches to satisfying mission requirements. The program is specifically designed to allow for the explicit consideration of reliability and cost uncertainties. In order to perform this evaluation, the launch systems and spacecraft (support systems** and sensors) are considered in detail from the points of view of reliability and cost. All costs are treated as uncertainty variables where ranges of possible values are considered as well as subjective estimates pertaining to the form of the uncertainty (the probability distribution) within the range. The input to the program consists primarily of a set of numbers which describes the demand for various operational sensors in orbit as a function of time, the mix of sensors available per spacecraft type, the transportation system to be used for each spacecraft type as a function of time, spacecraft subsystem, sensor and transportation system reliability, subsystem and sensor nonrecurring costs including cost spreading and explicit quantitative uncertainty assessments, spacecraft and transportation system costs including explicitly quantitative uncertainty assessments and cost learning rates. The output from the simulation program consists of a set of probability distributions associated with costs and events (i.e., number of launch attempts, etc.) as functions of time and the

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**The group of support systems is frequently referred to as the spacecraft bus.

probability distribution of the present value of total recurring plus nonrecurring cost.

The reliability, uncertainty and risk assessment capability embodied in the simulation model allows for:

- Specification of the mix of operational sensors required in geocentric orbits as a function of time.
- Consideration of multiple spacecraft which are defined in terms of the reliability of the major support subsystems, the mix of on-board sensors and their reliability and spacecraft cost.
- Consideration of spacecraft subsystem and sensor failure models which allow for both random and wearout failures.
- Specification and consideration of multiple transportation systems which may consist of current or new expendables or the Space Shuttle. The transportation systems may also include (as necessary) orbit-to-orbit shuttles or propulsion modules (for example, Agena, Centaur, Space Tug, etc.). The propulsion modules may be expendable or reusable and may be used for placing spacecraft in orbit and retrieving spacecraft which fail and require replacement. The specification of the transportation systems include cost and reliability assessments. Reliability is considered at the major subsystem level.
- Specification of transportation systems to be utilized for placing different spacecraft into orbit as a function of time. Changing the specification of transportation system-spacecraft assignment as a function of time allows performance capability (such as allowable mission modes and reliability) and cost variations to be considered.
- Explicit consideration of multiple time periods thus allowing for annual costs to be established.
- Consideration of cost learning curves.
- All costs to be treated as uncertainty variables.

The simulation model, taking into account the required number of sensors as a function of time, number of operational sensors in orbit (as determined from spacecraft subsystem and sensor reliability characteristics) and spacecraft and launch costs, determines a near optimal mix of spacecraft launches as a function of time. Since the simulation is based upon Monte Carlo techniques, it is possible to establish the probability distributions of pertinent performance measures, which allows alternatives to be compared by considering both expected values of performance measures and the chance of variation (i.e., the risk) of the value of the measures. Specifically, the simulation model establishes the probability distributions of:

- Pertinent quantities by year (for example, number of launch attempts, number of spacecraft required, number of propulsion modules required, number of propulsion module refurbishments, etc.)

- Launch, spacecraft and total costs by spacecraft type and by year
- Bus and sensor nonrecurring costs
- Present value of recurring plus nonrecurring costs.

The sensors mix as a function of time, as established from Figure 3.1, was used as the sensor demand in a simulation analysis. The purpose of this analysis was to obtain insight into the number of spacecraft that should be procured in order to achieve a reasonable likelihood of continuity of service and the number of launch attempts that are likely to be required. The scenario described in Figure 3.1 was simulated or flown 1,000 times taking into account sensor and spacecraft support system random and wearout failures and the probability of major launch events being successful. The assumed demand for sensors is illustrated in Table A.1, the assumed sensor and subsystem reliabilities are indicated in Table A.2 and the launch vehicle (Delta) assumed reliabilities are indicated in Table A.3.

Since an expendable launch vehicle is utilized, the probability distribution of the number of launch attempts and the probability distribution of the number of spacecraft required are the same. These are summarized in Table A.4 as a function of time in terms of expected values and standard deviation.

The results of the simulation analysis indicate that a minimum of two spacecraft of each type will be required. The likelihood of continuous service with the purchase of two spacecraft is not high and a third spacecraft acquisition may be desirable.

TABLE A.1 ASSUMED SENSOR DEMAND (NO. OF REQUIRED SENSORS IN ORBIT)

SENSOR	FISCAL YEAR									
	'85		'87		'89		'91		'93	
MSS (80M)	1	1	1	0	0	0	0	0	0	0
TM (30M)*	0	0	0	0	0	0	0	0	0	0
MLA (80M)	0	0	0	1	1	1	1	1	0	0
MLA (30M)	0	0	0	0	0	0	0	1	1	1

*LAUNCH DOES NOT TAKE PLACE UPON FAILURE OF THE THEMATIC MAPPER.

TABLE A.2 ASSUMED SENSOR AND SUBSYSTEM RELIABILITY

SENSOR/SUBSYSTEM	MEAN-TIME-TO-FAILURE (MTBF) (YEARS)	EXPECTED WEAROUT LIFE (YEARS)	VARIABILITY OF WEAROUT LIFE* (YEARS)
MSS	20	3	.5
TM	10	3	.5
MLA (80M)	25	5	.5
MLA (30M)	20	5	.5
POWER	30	5	.5
AVCS	30	5	.5
COMMUNICATIONS	30	5	.5
TT&C	30	5	.5
STRUCTURE	40	5	.5

*STANDARD DEVIATION OF WEAROUT LIFE.

TABLE A.3 LAUNCH RELATED RELIABILITIES

ITEM	VALUE
• PROBABILITY OF SPACECRAFT FUNCTIONING PROPERLY WHEN PLACED IN FINAL ORBIT	0.95
• PROBABILITY OF BOOSTER SUCCESS	0.98
• PROBABILITY OF UPPER STAGE SUCCESS	0.98
• PROBABILITY OF ORBIT INJECTION SUCCESS	0.98

TABLE A.4 LAUNCH ATTEMPT STATISTICS

SPACECRAFT TYPE	FISCAL YEAR									
	'85		'87		'89		'91		'93	
LANDSAT E (MLA/80M)										
• EXPECTED NO. OF LAUNCH ATTEMPTS	0	0	0	1.20	0.19	0.22	0.25	0.48	0	0
• STD. DEV. OF NO. OF LAUNCH ATTEMPTS	0	0	0	0.84	0.44	0.47	0.50	0.61	0	0
LANDSAT F (MLA/30M)										
• EXPECTED NO. OF LAUNCH ATTEMPTS	0	0	0	0	0	0	0	1.11	0.17	0.19
• STD. DEV. OF NO. OF LAUNCH ATTEMPTS	0	0	0	0	0	0	0	0.65	0.39	0.41

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APPENDIX B

SUPPORTING DOCUMENTATION FOR INPUT DATA TO FINANCIAL ANALYSES

(1) Revenue - Supporting data is presented in Section 4.4, Market Forecast. In particular, reference is made to Figures 4.5 and 4.6. All data in these figures are in constant 1983 dollars. A 6 percent inflation rate was used to escalate the figures to 1985 and following years.

(2) Additional Federal Purchases - Corresponds to the annual subsidy that is required in order to achieve a desired annual return on assets. The subsidy is determined through an iteration process wherein the value is adjusted until the desired rate of return is achieved.

(3) Processing Cost/Scene-80M - Processing costs include those costs involved with the processing and handling of data from the moment of receipt at GSFC until its expedition to EDC. For MSS data, the primary activities are to make radiometric corrections, indicate the need for geometric corrections and record the data on high density tapes which will be used to transmit the data via satellite to EDC. For TM data, the functions performed at GSFC include receipt and recording of data on high density tapes (to remain at GSFC until transfer to federal archives) plus creation of photographic negatives and computer compatible tapes (CCTs) from these high density tapes, which will be mailed to EDC. The following determination of the processing cost/scene for 80 meter information products is based upon data provided by NOAA and is based upon processing 136 scenes daily.

Cost Category	Cost ($1,000)
Operations and Maintenance	7,148
High Density Tapes	215
Computer Compatible Tapes	20
Computer Tape Drive Performance Assessment	20
Photo Support	950
Total Annual Cost (FY83$)	8,353
Total Annual Cost (FY85$)	9,385

$$\text{Processing Cost/Scene (80M)} = \frac{\text{Total Annual Cost}}{\text{Scenes/Year}} \times \text{Cloud Factor} = \$270.30$$

with a cloud factor equal to 1.43. The cloud factor (see Note 6) multiplier is used to account for the fact that the financial model is driven by scenes sold and not scenes processed.

(4) Processing Cost/Scene-30M - The following determination of the processing cost/scene for 30 meter information products is based upon data provided by NOAA. The processing cost is the incremental cost of processing 50 30 meter scenes daily in imagery and ten scenes daily on tape, given that 136 MSS 80 meter scenes are being processed daily. (Refer to Note 3 for a description of what is included in the current processing costs.)

Cost Category	Cost ($1,000)
Total HDT & CCT Tape & Handling	950
Photo Support	2,030
Ground Segement Operations & Maintenance	2,652
Total Annual Cost (FY83$)	5,632
Total Annual Cost (FY85$)	6,328

$$\text{Processing Cost/Scene (30M)} = \frac{\text{Total Annual Cost}}{\text{Scenes/Year}} \times \text{Cloud Factor} = \$495.80$$

with a cloud factor equal to 1.43. The cloud factor (see Note 6) multiplier is used to account for the fact that the financial model is driven by scenes sold and not scenes processed. The above cost per scene is based upon 18,250 scenes per year.

(5) Processing Learning Factor - It is assumed that processing cost for repetitive functions will tend to decrease with time because of learning. A typical learning equation, as indicated below, has been utilized to predict future cost reductions.

$$L(I) = \frac{\text{Cost in Year I}}{\text{Cost Base}} = I^{[\log_{10}(CALR) - 2.0]/.301}$$

The learning factor, L(I), indicates the cost in the I^{th} year relative to the current or base cost. The assumption is that costs are reduced by 100-CALR percent every time the number of years doubles. CALR represents the cumulative average learning rate (%). The processing learning factor is based upon a 90 percent learning curve. The specific values utilized are presented below along with learning factors based upon other learning rates.

FISCAL YEAR	LEARNING FACTOR, L(I)			
	LEARNING RATE, CALR			
	95%	90%	85%	80%
'85	1.00	1.00	1.00	1.00
'86	.95	.90	.85	.80
'87	.92	.85	.77	.70
'88	.90	.81	.72	.64
'89	.89	.78	.69	.60
'90	.88	.76	.66	.56
'91	.87	.74	.63	.53
'92	.86	.73	.61	.51
'93	.85	.72	.60	.49
'94	.84	.70	.58	.48

(6) Processing/Sales Factor - This factor accounts for the difference between scenes archived and scenes sold, since archived scenes may be sold more than once while other scenes may not be sold at all.

$$\text{Processing/Sales Factor} = \frac{\text{Total Scenes Received at EDC in FY82}}{\text{Total Scenes Sold in FY82} \times \text{Cloud Factor}}$$

The cloud factor represents an adjustment since scenes with significant cloud cover are handled in a somewhat different manner. Scenes received at Goddard Space Flight Center are flagged during processing to high density tape if the cloud cover is great enough to render the scene obscure. Although these scenes are currently processed for archiving at EDC, it is assumed that a decision will be made not to further process these obscure scenes, which are estimated at about 30 percent of the total. Therefore, the number of scenes processed (at GSFC) equals the number of scenes transmitted from White Sands, but scenes archived* at EDC will be reduced from scenes processed by a "cloud factor." It should be noted that:

No. of Scenes Transmitted from White Sands = No. of Scenes Processed at GSFC
No. of Scenes Archived = No. of Scenes Processed/CF
No. of Scenes Sold = No. of Scenes Processed/(CF x AF)

CF = Cloud Factor = 1.43
AF = Archival or Processing/Sales Factor = 0.52

*Scenes with too much cloud cover will be recorded on the high density tape (HDT) and retained in the archives, but it is assumed that further processing, such as producing a film master, will not be done.

The cloud factor of 1.43 is based upon 30 "bad" scenes out of 100 scenes (i.e., 70 "good" scenes). Therefore, to get 70 good scenes it is necessary to process 100 scenes or 1.43 times the 70 scenes. To go from scenes processed to good scenes it is necessary to divide by 1.43.

(7) Archival Cost/Scene-80M - Archiving costs are costs incurred in receiving data at EDC, processing data into format required for archiving and maintaining the archives. In the case of MSS data, after the receipt of data from GSFC it is recorded on high density tapes. Scenes from the high density tape are processed to film images which are sent to the photo lab and a master made. The high density tapes and film masters are then archived.

When EDC receives a TM film image from GSFC it makes a master film image for storage in the archives. The CCT it receives is stored in the archive after a copy is made for the client. TM archiving costs include the cost of making the film master plus cost of receiving and cataloging the data and maintaining the database.

Cost Category	Cost ($1,000)
Data Receipt & Catalog	669
Data Processing & Archive Creation	1,358
Archive Database Maintenance	148
Total Annual Cost (FY83$)	2,175
Total Annual Cost (FY85$)	2,445

Archiving Cost/Scene (80M) = $49.70
(based on archiving 49,275 scenes/year)

(8) Archival Cost/Scene-30M - Since data is not currently available on all of the TM archiving costs, approximations are necessary and are based upon scaling of MSS costs as follows. (Refer to Note 7 for what is included in archiving costs.) From Note 7, the average cost of receipt and catalog ($669,000) and archive database maintenance ($148,000) is $817,000 for MSS scenes. This reduces to $16.60 per scene. Since the number of items (film images or computer compatible tapes) should be about 1.75 times greater (TM has seven spectral bands whereas the MSS has four spectral bands) than produced for an MSS scene, it is assumed that the cost of receipt, cataloging and archive database maintenance for TM data is 1.75 times that of MSS data or $29.00 per scene. An approximate cost of making a working film master for storage

in the archive is $79.40 per TM scene. Therefore, the average cost to archive a TM scene is $108.40 FY83$ or $121.80 FY85$.

(9) Archival Learning Factor - A learning rate of 90 percent has been assumed. See Note 5 for details.

(10) Cost of Sales/Unit - Sales costs are those costs involved in reproducing scenes for sale to the public, and distributing the scenes. Film images are made from the film master which is stored in the archives. CCTs are made from the archived high density tape in the case of MSS data, and from the CCTs received from GSFC for TM data.

MSS estimated cost for reproduction and sale of approximately 78,750 film scenes is as follows:

	Cost ($1,000)
Product Generation & Dissemination	1,480
Customer Interface	645
	2,125

This results in MSS film cost of $27.00 FY83$ or $30.30 FY85$ per scene.

MSS estimated cost for reproduction and sale of approximately 4000 CCT scenes is as follows:

	Cost ($1,000)
Product Generation & Dissmenination	435
Customer Interface	215
	650

This results in MSS tape cost of $162.50 FY83$ or $182.60 FY85$ per scene.

TM costs are estimated to be 7/4 (the ratio of TM spectral bands to MSS spectral bands) times the MSS costs. Therefore, TM film and tape costs are estimated as $53.10 and $319.60 FY85$ per scene, respectively.

(11) Cost of Sales Learning Factor - A learning rate of 90 percent has been assumed. See Note 5 for details.

(12) Indirect Labor - Indirect labor costs are those costs that are independent of the number of scenes processed and include management, spacecraft maneuvering and positioning, and building operations and maintenance. These costs are as follows:

Cost Category	Cost ($1,000)
Building Operations & Maint.	1,651
Spacecraft Orbital Element	120
NOAA Management	2,500

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Communications-Telex Link to Foreign Stations	110
Building 28 Local Communication	45
NOAA Administrative Costs at EDC	32
Total Annual Cost (FY83$)	4,458
Total Annual Cost (FY85$)	5,009

(13) R&D - It is assumed that NASA will continue to undertake research and development relating to new sensors and related technologies and new information extraction techniques. It is assumed that the government R&D expenditures will be on the order of $10 million per year. It is assumed that a private sector business venture (Scenario 3) will undertake R&D to improve computational efficiency and information products. It is estimated that the cost (fully burdened) of a professional involved in the R&D is $90,000 per year. It is assumed that the R&D organization should include approximately ten professionals ($900,000/year) and will increase as sales build over time and achieve a level of 4 percent of sales. Therefore, R&D costs will be $900,000 per year or 4 percent of sales, whichever is greater.

(14) Marketing, Advertising & Promotion - Marketing, advertising and promotion includes customer interface, market development and applications engineering as well as the other sales-oriented functions. It is assumed that the average cost per salesperson is $158,000 ($45,000 in compensation multiplied by 2.5 for overhead and G&A, plus $45,000 in expenses). It is assumed that there are 1.5 professional persons supporting each salesperson at a cost of $75,000-$85,000 per year. Therefore, the effective cost per salesperson is $278,000 per year.

As a minimum, it is assumed that one salesperson is required for foreign sales (mainly keeping and getting new ground stations), one salesperson is required for federal sales, two salespersons are required for industrial and state/local government/academic sales. Therefore a minimum market organization is as follows:

4 salespersons 6 professional support	$1,110,000 per year
1 management ($65,000 x 2.5)	$ 160,000 per year
	$1,270,000 per year

It is assumed that this marketing organization will increase with sales reaching an expenditure level of 5 percent of sales. Therefore, Marketing, Advertising & Promotion Costs will be $1,425,000 FY85$ per year or 5 percent of sales, whichever is greater.

(15) Communications Costs (TDRSS) - This represents the cost of transmitting data through the Tracking Data Relay Satellite System from LANDSAT to the White Sands ground receiving station. Charges are based on a per minute rate depending on type of access.

A typical transmission lasts approximately 26 minutes and consists of a mix of the different types of access. This occurs approximately 20 times per day. During each 26 minute interval seven MSS and five TM scenes (on average) are transmitted. The average cost* for a typical transmission is

Access	Time		Cost per Minute	Total Cost Per Event
Single Access	14 minutes	x	$91	$1,274
Multiple Access Forward	2 minutes	x	$20	40
Multiple Access Return	10 minutes	x	$ 6	60
				$1,374

Therefore,

$1,374 = 7 x cost of transmitting MSS scene + 5 x cost of transmitting TM scene

It is estimated that the cost to transmit a TM scene will be 5.67 times that of an MSS scene.** The cost to transmit an MSS scene is therefore $38.90 (FY83$) or $43.70 (FY85$). This must be multiplied by the cloud factor (refer to Note 6) so that the total cost per MSS scene is $62.50 (FY85$). Similarly, the total cost (including the cloud factor) for transmitting a TM scene is $354.10 (FY85$).

*The analysis is based upon the use of rates for nongovernmental users rather than rates that will be charged to NOAA, because the former is likely to be more representative of the true costs of using TDRSS.

**TM data is transmitted at the rate of 85 megabits per second and MSS data at the rate of 15 megabits per second. Both require 24 seconds for a scene to arrive at White Sands (net of any time that the satellite isn't collecting usable data).

(16) Communications Costs (DOMSAT) - This represents the cost of transmitting data via the Domestic Communications Satellite System. Both TM and MSS data are transmitted from White Sands to GSFC using the DOMSAT 50 megabit link. MSS data is sent to EDC from GSFC on the DOMSAT 20 megabit link (TM data is mailed).

The cost of using the DOMSAT 50 megabit link is $3.50/minute. Including set-up and other overhead time,* it takes an estimated 48 seconds for an MSS scene and 72 seconds for a TM scene to arrive at GSFC. Therefore, MSS DOMSAT cost is:

MSS DOMSAT Cost = 0.8 minutes/scene x $3.5/min = $2.80/scene (FY83$)

It is assumed that the cost to transmit an MSS scene to EDC from GSFC is approximately the same as transmitting from White Sands to GSFC, $2.80. In addition, an inventory tape (GHIT) is communicated by phone to EDC and this costs about $.90 per scene; therefore total cost to send an MSS scene from White Sands to EDC is $6.50 (FY83$) or $7.30 (FY85$). This must be multiplied by the cloud factor (refer to Note 6) so that the total cost per MSS scene is $10.40.

The cost to send a TM scene from White Sands to GSFC is:

TM DOMSAT Cost = 1.2 minutes x $3.5/min = $4.20 (FY83$).

Adjusting to FY85 and multiplying by the cloud factor yields $6.70 per scene (FY85$).

(17) TDRSS Lease Costs (Annual) - This represents the lease costs associated with the Tracking Data Relay Satellite System which are independent of usage. Since TDRSS costs have been assumed to be directly proportional to scenes sold, this fixed annual cost has been set equal to zero.

(18) DOMSAT Lease Costs (Annual) - This represents the lease costs associated with the DOMSAT communication system which are independent of usage. Since DOMSAT costs have been assumed to be directly proportional to scenes sold, this fixed annual cost has been set equal to zero.

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*Time during which the system is turned on but not collecting useful data.

(19) Lease Costs (LANDSAT D and D') - It is assumed that for Scenarios 3 and 5, LANDSAT D and D' are transferred to the private sector business venture. Different recoupment payment policies are considered. Lease costs are zero for Scenarios 1, 2 and 4 since it is assumed that transfer of these assets is through nonlease arrangements.

(20) Lease Costs (Ground Facilities-GSFC, EDC, White Sands and Nongovernment) It is assumed that, initially, ground facility assets are leased from the government (operating leases with no transfer of title). It is assumed that in 1989 all facilities are consolidated at White Sands at which time leases are entered into with nongovernment organizations. It is assumed that the lease policy is to recoup a fraction (0 to 1.0) of the book value of the leased asset through an annuity such that the present value of the annuity is equal to δ x Book Value where δ is the fraction of the book value recouped and book value, BV, is given by

$$BV = \text{Acquisition Cost} \times \left[\frac{\text{Useful Life - Years in Service}}{\text{Useful Life}}\right].$$

And the value of the annual annuity payment, A, is given by

$$A = \frac{\delta \times BV \times r/100}{1-1/(1+r/100)^{M}}$$

Where r = cost of capital
M = number of payments for establishing lease rate.

The following schedule is assumed:

	FY									
	'86			'88		'90		'92		'94
GSFC	L_{GSFC}	L_{GSFC}	L_{GSFC}	L_{GSFC}	-	-	-	-	-	-
EDC	L_{EDC}	L_{EDC}	L_{EDC}	L_{EDC}	-	-	-	-	-	-
WHITE SANDS	L_{WS}	L_{WS}	L_{WS}	L_{WS}	L_{WS}	L_{WS}	L_{WS}	L_{WS}	L_{WS}	L_{WS}
NONGOVERNMENT	-	-	-	-	L_{NG}	L_{NG}	L_{NG}	L_{NG}	L_{NG}	L_{NG}

Econ

The venture initially leases facilities (GSFC processing facilities, EDC processing and archiving facilities, and White Sands tracking and communications facilities) from the government. These lease rates are L_{GSFC}, L_{EDC} and L_{WS}. After consolidation the venture leases similar equipment to be located at White Sands. It is assumed that the lease rate of White Sands equipment is small relative to that at GSFC and EDC. The lease rate of the equipment to be acquired and located at White Sands is approximated as follows:

$$L_{NG} = (L_{GSFC} + L_{EDC}) \times E \times L - L'_{GSFC}$$

where E is an efficiency factor relating to the consolidation of the EDC and GSFC data processing facilities, L is a learning factor (it is assumed that both processing algorithms and equipment improve with time) (refer to Note 5 for a discussion of learning factors) and L'_{GSFC} is the effective lease rate paid on equipment not required at the combined facility.

A 90 percent learning rate is assumed. Therefore L = 0.78. It is assumed that the cost of computers to the government has a profit built in for the private sector. When the commercial entity leases a computer from the private sector there is also a profit for the private sector. It is assumed that these are basically the same on a percentage basis. NOAA has estimated equipment costs at GSFC to be approximately $101 million and EDC has estimated equipment cost associated with LANDSAT at EDC to be approximately $14 million.

The following lease rates have been estimated and used in the analysis:

$$BV(GSFC) = \$101 \text{ million} \times \left[\frac{\text{8 yrs. useful life - 2 yrs. prior to start of lease}}{\text{8 yrs. useful life}}\right]$$

$$BV(EDC) = \$14 \text{ million} \times \left[\frac{\text{8 yrs. useful life - 4 yrs. prior to start of lease}}{\text{8 yrs. useful life}}\right]$$

At a cost of capital of 10 percent,

$$L_{GSFC} = 101 \times \left(\frac{8-2}{8}\right) \times .10/[1-1/1.10)^4] = \$23.9 \text{ million}$$

$$L_{EDC} = 14 \times \left(\frac{8-4}{8}\right) \times .10/[1-(1/1.10)^4] = \$2.2 \text{ million}$$

$$L_{NG} = (23.9 + 2.2) \times .78 \times .90 - 2 = \$16.3 \text{ million}$$

Econ

where E = .90 and L'_{GSFC} = $2 million.

Since the lease at White Sands starts in 1989, L_{NG} must be adjusted from FY83 to FY89 dollars by multiplying by $(1.06)^6$. The result is

L_{NG} = $23.12 million FY89$ in FY89 and beyond.

(21) Assets: Ground Segment - It is assumed that all ground segment equipment is leased. Therefore the asset value of the ground equipment is zero.

(22) Space Segment - The following is a summary of the launch costs and the availability of launch vehicles. LANDSAT D consists of the NASA standard Multi-Mission Modular Spacecraft (MMS) and a mission-unique sensor module. LANDSAT D was launched into a nominal 425 n mi sun synchronous polar orbit by a Delta 3920 launch vehicle from the U.S. Western Test Range.

The MMS is designed to be compatible for launch from both the Delta and the Space Shuttle Orbiter. However, the long (14' length) and narrow (7' width) configuration of LANDSAT D is not optimum from a cost standpoint for Shuttle launch. As the MMS is designed for compatibility with the Delta and Shuttle, it will also be compatible with the Ariane launch vehicle. These three launch vehicles constitute the primary candidates for further launches of LANDSAT spacecraft in the configuration of LANDSAT D. Other expendable launch vehicles such as proposed commercial versions of the Atlas-Centaur or Titan could also be used; however, the use of these launch vehicles would necessitate design modifications in the spacecraft. Moreover, there are no plans at the present to achieve a near polar orbit capability with the commercial Titan.

For the purpose of obtaining launch cost information it was assumed that the future LANDSAT spacecraft would be similar in physical characteristics and orbit requirements to LANDSAT D. Launch dates of January 1987, January 1991 and January 1996 were used to solicit launch cost information from the operators of the Ariane, Delta and Shuttle.

The results of these enquiries indicate that the launch vehicle area is in a state of flux and it is difficult to obtain costs that can be used with a great deal of certainty for the prospective launches. At the present time the Delta Program Office does not plan to continue to supply the Delta launch vehicle after its use for two GOES missions in FY86. In response to this enquiry,

NASA quoted a cost of about $35 million in FY85 dollars for a Delta launch prior to the termination of the program in FY86. NASA was unable to quote costs beyond this date because of the planned termination of the Delta launch vehicle. Informal discussions of the proposed launches with NASA Shuttle marketing personnel indicate that NASA has not yet formulated a pricing policy for WTR launches. Moreover, the published Shuttle pricing policy does not extend beyond FY88. In the absence of a pricing policy that extends to the time period of interest for WTR, it was suggested that the price of a Shuttle launch from WTR would be about the same as that from ETR. Because of the spacecraft configuration, weight and orbit requirements, LANDSAT would probably require a dedicated Shuttle launch. The suggested price for a dedicated Shuttle launch from WTR was about $40 million in 1975 dollars. Discussions with Arianespace indicate that the LANDSAT launch would require the Ariane 40 vehicle. Funding for the development of the Ariane 4 series of launch vehicles was approved in 1982 and it is expected to be operational in 1986. Discussions with Arianespace indicate that the budgetary price for an Ariane 40 launch is $60 million to $65 million in 1982 dollars.

On the basis of this brief survey, it is clear that the Shuttle will be supported from WTR. On the other hand, it is not clear that any of the current U.S. expendable launch vehicles will be supported from WTR post FY86. One possible scenario for this time period might postulate competition between two or more U.S. launch vehicles and perhaps the Ariane. Although NASA now indicates that it will not support the Delta in the post FY86 time period; it is possible that competition will drive the price of competing launch systems to that quoted for the Delta, or that a commercial version of the Delta will be developed as one of the competitors. In view of the clear price advantage of the Delta 3920, the price of the Delta 3920 was used as the basis for estimating launch costs for the prospective LANDSAT launches.

(23) Assets: Space Equipment - The space equipment assets include LANDSAT D, D', E, E', F, F', G and G'. These are procured at different points on time with both D and D' having already been procured.

Data from GSFC indicates a total cost of $361 million for D and D'. It is assumed that this cost is divided evenly between D and D'. Therefore

$$\text{LANDSAT D Book Value} = [180 + 35] \times \left[\frac{\text{3 yr. life-2 yrs. used by '85}}{\text{3 yrs. life}}\right]$$
$$= \$71.7 \text{ million}$$

$$\text{LANDSAT D' Book Value} = [180 + 35 + 33] \times [1]$$
$$= \$248 \text{ million}$$

where it has been assumed that the Delta launch cost is $35 million and D' storage cost is $33 million.

The following cost estimates (in millions of dollars) have been made for the post-D' satellites:

	LANDSAT E	LANDSAT E'	LANDSAT F	LANDSAT F'
SPACECRAFT	$40x(1.06)^3$	$40x(1.06)^3$	$40x(1.06)^6$	$40x(1.06)^6$
MLA (80M)	$50x(1.06)^3$	$10x(1.06)^3$		
MLA (30M)			$75x(1.06)^6$	
INTEGRATION/TEST	$20x(1.06)^3$		$20x(1.06)^6$	$30x(1.06)^6$
LAUNCH COST	$35x(1.06)^3$	$35x(1.06)^3$	$35x(1.06)^6$	$35x(1.06)^6$
TOTAL COST (10^6S)	172(FY86$)	101(FY86$)	241(FY89$)	149(FY89$)

Since costs are spread over time, the above table is an approximation but deemed acceptable.

LANDSAT E is estimated as a two and one-half to three year program with expenditures of 20 percent, 50 percent and 30 percent in each of the years (as per GSFC). LANDSAT F is estimated as a five year program with expenditures of 15 percent, 20 percent, 30 percent, 20 percent and 15 percent in each of the years (as per GSFC). These values have been adjusted to reflect the launch costs. Thus, as indicated by the "Construction In Progress," the cumulative expenditures add up to 100 percent when launch occurs.

Without knowledge of what G and G' will comprise, annual expenditures have been estimated and are based upon the previous history of expenditures.

(24) Cash Requirement in Days - It is assumed that 15 days of cash are required as measured against total revenue (i.e., 15/365 x total revenue).

(25) A/R Requirement in Days - It is assumed that accounts receivable are an average of 60 days old. Average accounts receivable balance is equal to approximately 1/6 of revenue (i.e., 60/365 x revenue).

(26) Current Liability Requirement in Days - Current liabilities are assumed to be paid within 30 days.

(27) Contributed Capital - Contributed capital for the private sector financial projections are assumed to be an initial capitalization of $75 million. The capital investment remains constant over the ten year period.

(28) Cost of Borrowing - Long-term borrowing rates are assumed to be 11 percent over the ten year projection. The 11 percent borrowing rate is predicated upon the 6 percent inflation rate used in the projection. Although current long-term borrowing rates are currently higher than 11 percent, it is assumed that by 1985, the first year of the projection, that long-term rates will be in the 10-12 percent range.

(29) Federal and State Tax Rate - A 51 percent combined federal and state tax rate has been used to calculate provision for taxes on net income (46 percent federal, 5 percent state).

(30) Investment Tax Credit Base - Property qualifying for the investment tax credit is reflected for calculation purposes. All space segment property both fully constructed and in process during the year are included in the investment tax credit base.

(31) Investment Tax Credit Rate - A 10 percent investment tax credit has been applied to all qualified property. For tax purposes, a five year ACRS life has been assumed. For depreciation purposes, a 5 percent reduction to the basis of all depreciable property has been applied.

(32) Equity Participation by the U.S. Government - It is assumed that for the legislatively-chartered, privately-owned corporation scenario, the U.S. government's equity participation will be 33 percent. The percentage participation used is arbitrary, and is used for illustrative purposes.

(33) Research and Development Tax Credit Rate - A 15 percent R&D tax credit rate has been assumed although the precise rate may vary. The exact rate applied will be dependent upon the nature of the R&D, average annual expenditures and type of R&D (in-house research expenses vs. contract research expenses).

(34) Royalties—Base Fee - This amount reflects the minimum guaranteed royalty or licensing fee paid to the U.S. government under the private sector marketing scenario. A minimum base fee of $33.5 million for the exclusive marketing rights to LANDSAT data is assumed.

(35) Royalties as a Percentage of Sales - It is assumed that a minimum royalty of 80 percent of LANDSAT sales would be paid to the U.S. government if 80 percent of sales exceed the guaranteed minimum of $33.5 million.

(36) Government R&D Expenditures - Current government R&D expenditures relating to the current land remote sensing system are not currently accumulated in a manner conducive to used for projection purposes. A $10 million per year R&D expenditure by the U.S. government has been used for projection purposes in all scenarios other than planned phase-out.

(37) Direct Costs - The equations used for the computation of processing, archiving and sales costs are as follows:

$$\text{Processing Cost (I)} = [MTS(I) + MFS(I)] \times K \times P_{MSS}(I) + [TTS(I) + TFS(I)] \times K \times P_{TM}(I) + ID(I)$$

$$\text{Archival Cost (i)} = [(MTS(I) + MFS(I)) \times A_{MSS}(I) + (TTS(I) + TFS(I)) \times A_{TM}(I)] \times AF \times L_A(I)$$

$$\text{Sales Cost (I)} = [MTS(I) \times S_{MSST}(I) + MFS(I) \times S_{MSSF}(I) + TTS(I) \times S_{TMT}(I) + TFS(I) \times S_{TMF}(I)] \times L_S(I) + [MTS(I) + MFS(I) + TTS(I) + TFS(I)] \times CI(I)$$

$K = CF \times AF$

where

$MFS(I)$	=	Number of MSS film scenes sold in year I
$MTS(I)$	=	Number of MSS tape scenes sold in year I
$TFS(I)$	=	Number of TM film scenes sold in year I
$TTS(I)$	=	Number of TM tape scenes sold in year I
$P_{MSS}(I)$	=	Per scene cost to process MSS data at Goddard
$P_{TM}(I)$	=	Per scene cost to process TM data at Goddard
$ID(I)$	=	Indirect costs associated with processing MSS and TM data at Goddard
$A_{MSS}(I)$	=	Per scene cost to archive MSS data at EDC
$A_{TM}(I)$	=	Per scene cost to archive TM data at EDC
$L_A(I)$	=	Learning rate associated with the archiving procedure
$S_{MSST}(I)$	=	Per scene cost of reproducing for sale an MSS tape scene
$S_{MSSF}(I)$	=	Per scene cost of reproducing for sale an MSS film scene
$S_{TMT}(I)$	=	Per scene cost of reproducing for sale a TM tape scene

Econ

$S_{TMT}(I)$ = Per scene cost of reproducing for sale a TM film scene

$L_S(I)$ = Learning rate associated with reproducing for sale

CI = Per scene cost of customer interface

AF = Archival factor (see Note 6)

CF = Cloud factor (see Note 6)

(38) Communicatons Cost - The equations used for the computation of TDRSS and COMSAT costs are as follows:

$$\text{TDRSS Cost (I)} = [MFS(I) + MTS(I)] \times K \times T_{MSS}(I) + [TFS(I) + TTS(I)] \times K \times T_{TM}(I)$$

$$\text{DOMSAT Cost (I)} = [MFS(I) + MTS(I)] \times K \times D_{MSS}(I) + [TFS(I) + TTS(I)] \times K \times D_{TM}(I)$$

where

$T_{MSS}(I)$ = Per scene cost to transmit MSS via TDRSS (satellite to White Sands)

$T_{TM}(I)$ = Per scene cost to transmit TM via TDRSS

$D_{MSS}(I)$ = Per scene cost to transmit MSS via DOMSAT (from White Sands to Goddard, and from Goddard to EDC)

$D_{TM}(I)$ = Per scene cost to transmit TM via DOMSAT (White Sands to Goddard)

and other terms are as defined in Note 37.

Econ

Mr. VOLKMER. Thank you very much.

Mr. Porter, you may proceed, and your statement will be made a part of the record. You may summarize or read your whole statement.

Mr. PORTER. Thank you very much.

Mr. Chairman, members of the Space Applications Committee, I appreciate the opportunity to speak to you this morning on the commercialization of Landsat. For the purposes of this panel session, I would like to present to you a summary version of the comments which I supplied to your staff and to the committee.

I would also like to note that Dr. Charles Sheffield, to my right, who managed the recent study conducted by our company for Satellite Corporation and Abt Associates, for the Department of Commerce is also here with me this morning. He is available to answer any questions on that study.

There are three fundamental points that I would like to make which go well beyond the scope of the commercialization study. First, as a generalization, the goal of the Government program in Earth resources has been to expedite the familiarization of the public with Landsat data, while the goal of industry would be to show a profit, preferably within the short term.

These differences in objectives reflect themselves in the way that industry and Government view the markets. Government tends to measure success by the number of users of Landsat data, while industry looks at the profitable markets and instead focuses on the profit potential of these markets.

Figure 1 makes this point graphically by looking at the four categories of users. That is appended to the back of your handout, the triangle.

Category 1, which is in the lower part of the triangle, is a first-time or infrequent user who is familiarizing himself with the satellite product.

Category 2 is the more serious user who would pay additional money for digitally enhanced images.

Category 3 is the highly sophisticated user who owns a computer with an interactive display, and category 4 is the proprietary model user, who has developed his own proprietary models and techniques which become a major component in directing his entire program.

The way industry currently leverages its proprietary techniques is presented graphically in four categories in figure 2. The smallest leverage is gained through the sale of consulting services, which is herein identified as category 1, which are highly labor intensive.

The second category, the interpreter is able to obtain a royalty interest in addition to consulting fees.

The third category includes quid pro quo considerations, such as the case where a company obtains a privileged position in obtaining oil concessions with a foreign government, in return for the provision of a sophisticated geological analysis of a much larger area.

Finally, an example of the direct investment category would be a large oil company which is able to develop a proprietary oil exploration technique, as well as provide capital, to leverage fully the results for its own benefit.

If one pauses now and reflects on this latter triangle in the context of cost-benefit studies, several thoughts become relevant. First, there is little likelihood that, except for consulting, any of the other leverage categories would be reflected in any measurable way in subsequent studies as a benefit, in part, because they are made possible through value-added techniques which are not reflected in the sales price of the raw product and in part because the end user has commingled the data with other information so as to make the assignment of a separate weight factor virtually impossible.

If you wish to ask later, I can cite you several case examples that we have dealt with in our business.

The point of these comments is to dramatize the importance of value-added services in considering the commercialization issue. By "value-added services," I mean those services that are added on after the raw data is processed and formated for public dissemination.

Naturally, there is a great desire on the part of the producers of raw data to capitalize on it further. I understand this sentiment. It is clear to me that from the strictly business, profit-oriented viewpoint, the most effective way to capitalize on the commercialization of Landsats and Metsats is to aggressively develop proprietary techniques and fully exploit them in a highly leverage basis. For example, first, developing a credible base for increasing success for oil and mineral exploration, and secondly, developing a credible basis for predicting commodity prices, or factors that bear on the commodity prices.

These are both, in my opinion, realistic objectives within the next 10 years. Furthermore, significant steps are already underway to accomplish these objectives, both domestically and abroad. The significance of succeeding in either instance is so great that the financial and geopolitical implications are beyond contemplation.

I believe we would do a disservice to the U.S. interests if we were to create a monopoly that extended into the value-added service business. I say this because no single group has the resources to develop markets in all the directions which need to be pursued and to focus U.S. technology too narrowly at this time would be shortsighted.

Second, to the present date, the United States has operated its civilian program on a totally open basis. That is, all data is put into the public domain promptly. Out of habit, we have come to expect that others will do the same.

However, if technology and the products of technology become a base of power, it is only logical that in time this power will be protected by its creator. One of the striking differences between industry and Government is Government's policy of publicizing accomplishments, spreading the word, while industry emphasizes secrecy and the policy of protecting markets and patents.

To my knowledge, in the area of Earth resources, there are no treaties insuring complete nondiscriminatory availability of data collected from civilian remote sensing satellites. As the technology becomes more developed, more proprietary and more powerful, it is clear that the only way to insure that technology is available to you is to develop it yourself.

It is important to recognize the fact that the United States cannot control foreign technology, nor its dissemination; it can only undertake actions which insure that we have high-quality systems available to meet our needs.

Third, the options for commercialization of land remote-sensing programs in the United States can best be evaluated by looking at two extreme cases. In the first of these, the commercial operator is not permitted to offer any value-added services and must provide data on a nondiscriminatory basis to any user willing to pay for it.

At the other extreme, a commercial operator runs the satellite system of the preferred service to a small suite of users who have high value applications and are willing to pay a great deal for the data they want.

Looked at from the point of view of one seeking to minimize short-term outlay of funds, the second approach may appear very attractive. Looked at in terms of maturity of U.S. technology and use, remote sensing from space is in its infancy, and without some nurturing by Government, there is real danger that a land remote sensing systems summarily handed out to the private sector might collapse totally to our national detriment.

Finally, we recommend that the transition of the land remote sensing program to the private industry take place only if significant constraints and incentives to benefit the public can be placed on their acquirer. These include: First, the data access should be provided to the widest possible group of users, even if this means short-term Government cost or subsidies; second, the private operators should operate under a legal framework, for example, as in a legislatively chartered private corporation, which prohibits the performance of selected value-added services.

We recognize that to attain this end, some Government support may be necessary to make the program attractive to industry until a broad user market is developed or a freely competitive, profitable proprietary market is established.

What we are seeing today in commercial applications of satellite remote sensing can be interpretated as the first faint shadow of the coming division between long-term development and short-term profit taking. Both activities must have a place within any satisfactory future of the U.S. remote sensing program.

Thank you.

[The prepared statement of Mr. Porter follows:]

STATEMENT OF J. ROBERT PORTER, JR.
PRESIDENT, EARTH SATELLITE CORPORATION
BEFORE THE HOUSE SUBCOMMITTEES ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT AND SPACE SCIENCE AND APPLICATIONS
OF THE COMMITTEE ON SCIENCE AND TECHNOLOGY

June 28, 1983

Chairman Volkmer, Chairman Scheuer, members of the Committees on Science and Technology. I appreciate the opportunity to speak to you today regarding the commercialization of Landsat. I would, however, like to go beyond the scope addressed by the study recently completed by our company, Earth Satellite Corporation, and Abt Associates, Inc., under the auspices of the Department of Commerce. There are three fundamental points I would like to make.

POINT 1: The assessment of the Landsat data market and the resulting strategy of industry is likely to be dramatically different from the market assessment and traditional strategy of government. This difference is so great as to bring into serious question the relevance of traditional cost/benefit studies. Further, it makes the issue of "value-added services" central to commercialization.

POINT 2: The days of "non-discriminatory distribution" of data from earth sensing satellites are numbered and will probably end with the transition from "first generation, general purpose satellites" to "second generation, proprietary application satellites" whose design will be optimized from models developed during the 80's. The 1990's will probably be a highly competitive world of proprietary interpretation and acquisition systems.

POINT 3: We recommend that the transition of land remote sensing programs to private industry take place only if significant constraints and incentives to benefit the public can be placed on their acquirer. We recognize that to attain this end some government support may be necessary to make the program attractive to industry until a broad user market or a freely competitive profitable proprietary market is established.

DISCUSSION OF POINT 1

In order to understand the strategies of industry and government, it is first necessary to understand the way they view the market. For the sake of an example, let us consider four categories of users for oil exploration:

1 - A "first time" or infrequent user who is familiarizing himself with the satellite product. Characteristically, he would purchase a few prints from the EROS Data Center looking for regional structural data which may support an exploration plan he has developed independently.

2 - A "serious" user who will probably pay additional money for a digitally processed image at 1:250,000 scale or larger and invest money for personnel to interpret the imagery and recommend land acquisition or plan geophysical programs.

3 - A "highly sophisticated user" who probably owns a computer with interactive display, requires CCT's, may want more than one time coverage, and uses Landsat as an important component in his exploration activities.

4 - The "proprietary model user" who has developed proprietary techniques which become a major component in directing his entire exploration program.

Next, let's consider the distribution of these data users both by number and by the value which is realized by them. This comparison is shown in Figure 1. It should be noted that the perspective shown in the upper triangle represents the traditional government view of the market and has the objective of providing the most data for the greatest number of people (non-discriminatory distribution) while the lower triangle represents the traditional view of industry (implying discrimination between clients on the basis of profit potential).

Further, let's look at the way industry currently leverages its proprietary techniques. This is presented graphically in Figure 2 in four categories. The smallest leverage is gained through the sale of consulting services (Category 1) which is highly labor intensive. In the second category, the interpreter is able to obtain a royalty interest in addition to, or in lieu of, consulting fees. In the case of oil exploration, this may range from 2 to 25 percent. The third category includes quid pro quo considerations. For example, the case in which a company obtains a privileged position in obtaining oil concessions with a foreign government

in return for the provision of a sophisticated geological analysis of a much larger area or provides a "special edge" to the formation of a partnership. Finally, the category which ultimately brings the greatest return is "direct investment" which, in the example of oil exploration, would include the case in which a large oil company is able to develop a proprietary technique as well as provide capital to leverage fully the value of its results for its own benefit.

If one pauses now and reflects on this latter triangle in the context of cost benefit studies, several thoughts become relevant. First, there is little likelihood that, except for consulting, any of the other leverage categories would be reflected in any measurable way in subsequent studies as a "benefit," in part, because they are made possible through value-added techniques which are not reflected in the sales price of the raw product and, in part, because the end user has co-mingled that data with other information so as to make the assignment of a separate weight factor virtually impossible. Let me cite two examples from our own experience.

In one instance we applied a proprietary technique we developed to oil exploration and found a field whose value is estimated by the operator to be approximately $100 million. We were paid approximately $100,000 for the study, plus we were given an overriding royalty. The consulting fee only offset our costs while our real return comes from the royalty interest. But what about the return to the oil company that made the investment? What part of that return should be attributed to the "benefit" side of the ledger? What about the value received by the non-participant who owned adjacent land and had reserves proved up on his land? All the

beneficiaries of this technology paid taxes to the government!

In the second instance, we provided a crop forecasting service to an individual commodity investor over a 3-1/2 year period. In return for our services, he paid us 50% of the profits he realized in his trading account. Consequently, we were able to follow, in detail, a "real life" example of the application of a proprietary crop forecasting technique. Figure 3 demonstrates those results. Unfortunately, from our standpoint, the initial amount invested was only $50,000. However, we have also been selling this service on a consulting basis to other clients with a much greater asset base and we do know they are pleased with the results. How do you rank this type of consideration in estimating cost benefits? Clearly, the benefits are proportional to the amount you can afford to invest which is, in turn, related to the confidence you place in the technology.

The point of these comments is to dramatize the importance of "value-added services" in considering the commercialization issue. I have been struck in the hearings I have attended and articles that I have read on the commercialization process that so little time has been devoted to this critical issue. By "value-added services" I mean those services that are added on after the raw data is processed and formatted for public dissemination. Naturally, there is a great desire on the part of the producers of raw data to capitalize on it further. While I understand this sentiment, I respectfully submit that I believe we would do a severe disservice to U.S. interests were we to create a monopoly which extended into the value-added service business. I say this because no single group

has the resources to develop markets in all of the directions which need to be pursued at this time and to focus U.S. technology too narrowly at this time would be shortsighted. The truth of this statement is underscored by the fact that not even the U.S. Government can undertake all the research activities it wants. This is why, I believe, in the near-term, U.S. industry will benefit from sharing the technology and expense with non-U.S. activities such as the French and Japanese. I feel it is very important that we not narrow our first generation programs any more than absolutely necessary and this is exactly what will happen if we wrap data acquisition and value-added services into a single package at this time. I say this because it is clear to me that from a strictly business, profit-oriented viewpoint, the most effective way to capitalize on the commercialization of Landsats and Metsats is to aggressively develop proprietary techniques and fully exploit them on a highly leveraged basis. For example:

(1) Developing a credible basis for increasing success of oil and mineral exploration.

(2) Developing a credible basis for predicting commodity prices.

These are both, in my opinion, realistic objectives within 10 years. Furthermore, significant steps are already underway to accomplish these objectives both domestically and abroad. The significance of succeeding in either instance is so great that the financial and geo-political implications are almost beyond contemplation.

DISCUSSION OF POINT 2

To the present date, the United States has operated its civilian program on a totally open basis; that is, all data is put into the public domain promptly. This is frequently referred to outside of the government as an "open skies" policy. Actually, while this term had its origins in the Eisenhower era to emphasize the fact that photographic coverage of a country did not require that country's prior consent, its current usage has been broadened well beyond its original intentions. Terminology aside, the earth resources civilian surveys of earth from outer space by U.S. satellites have created an environment of openness which most people now take for granted. Out of habit, we have come to expect that others will do the same. Indeed, these hopes are reinforced by the plans the French have announced for the widespread dissemination of much data from their forthcoming SPOT program.

However, if technology and the products of technology become a base of power, it is only logical that in time this power will be protected by its creator. One of the striking differences between industry and government is the government's policy of publicizing accomplishments (spreading the word), while industry emphasizes secrecy and the policy of protecting markets and patents. One might reasonably ask on what basis we assume that such data will continue to be made available to U.S. companies in the future. To my knowledge in the area of earth resources, there are no treaties insuring complete non-discriminatory availability of data collected from civilian remote sensing satellites. Further, as the technology becomes more developed, more proprietary and more powerful, it is clear that the only way to insure that technology is available to you is

to develop it yourself.

It is important to recognize the fact that the U.S. can't control foreign technology nor its dissemination; it can only undertake actions which insure that U.S. Government and industry have high quality systems available to meet its needs. There is no question that this technology will be developed in an international framework which does not owe homage to U.S.-defined spatial, spectral and frequency dictates. Further, there is no question but that each of the future systems will provide some potential edge for its creator. For example, the French SPOT system has a 20 and 10 meter resolution camera system with stereo capability and the Japanese are reportedly considering a radar system for launch in the late 1980's. Current U.S. civilian satellites don't have these systems nor are they currently planned. I am not suggesting that these systems are counter to the U.S. interest. In point of fact, I expect the data will be largely available and will be helpful to U.S. industry. I would emphasize, however, that these are all "first generation" systems in that they are broadly intended to evaluate the sensor potential of their payloads. The "second generation" systems will develop after these and will be designed to apply the spectral and spatial knowledge in a much more focused and proprietary fashion. It is my unequivocal belief that by the time the second generation model-oriented applications satellites are launched, there will be a highly competitive aspect to this technology just as we have seen it evolve in the computer industry.

DISCUSSION OF POINT 3: Conclusions and Recommendations

The options for commercialization of land remote sensing programs in the U.S. can best be evaluated by looking at two extreme cases. In the first of these, the commercial operator is not permitted to offer any value-added service, and must provide data on a non-discriminatory basis to any user willing to pay for it. At the other extreme, a commercial operator runs the satellite system with preferred service to a small suite of users who have high value applications and are willing to pay a great deal for the data they want.

Let us consider the return to the U.S. Government, both short and long term, of these two extreme alternatives.

As we have already remarked, evolution of new Category 4 users is a slow and uncertain business. It may take five or more years of continuous data access and data analysis before a Category 4 user emerges. During this period, the commercial operator must provide data to a whole spectrum of users, and no one (including the users) knows in this time frame where the highly profitable application will appear. Evaluated in traditional cost/benefit terms, which have no place in their framework for unexpected innovation, the commercial operator and the government will see little return on their investment during the whole development period. It is difficult to see how the U.S. Government land remote sensing program could be turned over to private industry ownership and operation during this development period without substantial subsidy or guaranteed data purchases. Any profit-oriented group that looks at the existing government program will recognize at once that it was never designed for commercial operation. Most of the standard components of profit-oriented business are

missing: no sales force, no product development group, no advertising department, no market projection group, and no industry development specialists. Current sales run far below current costs. However, an approach that emphasizes wide data dissemination also maximizes the probability that new Category 4 users will be nurtured, and hence offers the best long-term profit potential to the U.S. Government. Since this approach also maximizes the spread of the technology through the whole of government and industry, it probably has the best long-term beneficial results for the country as a whole.

This should be compared with the second approach, which immediately focuses data services on known areas of high profit potential. Short-term return on investment will be at a maximum, but the focused development of instruments and processing techniques will inhibit the broad potential for new Category 4 users. Thus, long-term return on investment potential will be diminished.

In the first approach, the initial government investment will finally be disseminated to the widest possible user group; in the second approach, the earliest and principal beneficiaries of government investment will be those corporations with the technology and capital to gain maximum use of Category 4 applications.

Looked at from the point of view of one seeking to minimize short-term outlay of funds, the second approach may appear very attractive. However, it has possible long-term disadvantages to the nation. Looked at in terms of maturity of technology and use, remote sensing from space is in its

infancy. Today's systems are critically dependent upon the success or failure of key spacecraft components. A decade from now, this equipment could be repaired and replaced using the Space Shuttle, but now our land remote sensing systems are unacceptably vulnerable for commercial enterprise. Logically, we are still at a stage where research activities are the appropriate province of government. Without some nurturing by government, there is a real danger that a land remote sensing system summarily handed out to private operation might collapse totally.

We therefore recommend that the transition of the land remote sensing program to private industry should take place with these constraints in mind:

(1) Data access should be provided to the widest possible group of users, even if this means increased short-term government costs or subsidies. We regard such short-term subsidies as almost inevitable if wide data access is desired.

(2) The private operator should operate under a legal framework (e.g., as in a legislatively chartered private corporation) which prohibits performance of selected value-added services. This recommendation certainly limits the profit potential of the private operator, and will to this extent certainly be controversial.

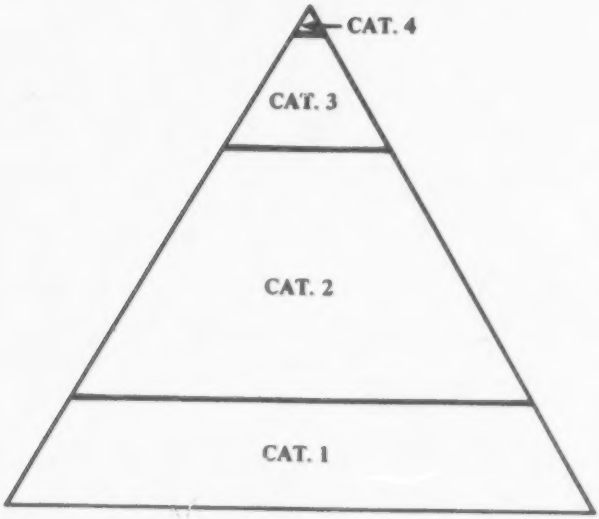
(3) Evaluation of program benefits to the nation should be performed within a realistic time frame. In addition, the

inability of a traditional cost/benefit approach to account for the contribution of Category 4 activities to the national economy should be recognized. It is difficult to find and quantify Category 4 users, since this group of users have much to gain from anonymity. However, the absence of evidence should not be confused with evidence of absence. We know that 10 years of operation of the Landsat program has created, today, Category 4 users. Continued access to radar data, thematic mapper data, and marine observation systems will undoubtedly lead finally to new Category 4 applications. The first group to understand and exploit fully the data from the Thematic Mapper will probably become very rich. The same is true for spaceborne Synthetic Aperture Radar data.

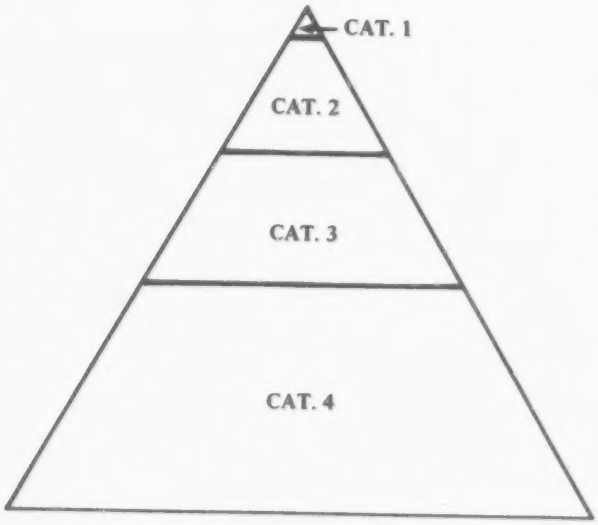
(4) If we take the short view of remote sensing technology, and maximize for quick return on investment and no continuing program, we should not lose sight of the fact that other nations are employing a different economic philosophy. By the 1990's, we should expect to see two categories of space remote sensing systems. The first will be government supported, development oriented and designed to stimulate the next generation of Category 4 applications. The second will be application-specific satellites, flown to maximize the immediate return from known Category 4 uses. These satellites may have no government funding, return their data to a single small group of users, and operate outside the control of the U.S. Government.

What we are seeing today in commercial applications of satellite remote sensing can be interpreted as the first faint shadow of the coming division between long-term development and short-term profit taking. Both activities must have a place within any satisfactory future of the U.S. remote sensing program; however, if unrestricted by suitable legislation, there is no doubt that any rational company must favor short-term profits at the expense of unproven long-term ones.

MARKET FOR SATELLITE DATA



Number of Data Users



Value Realized by Data Users

Figure 1

WAYS INDUSTRY LEVERAGES PROPRIETARY LANDSAT TECHNIQUES

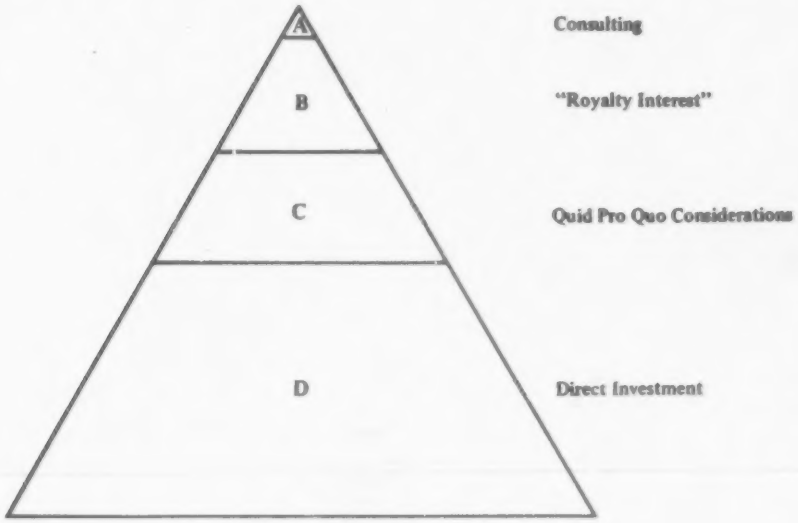


Figure 2

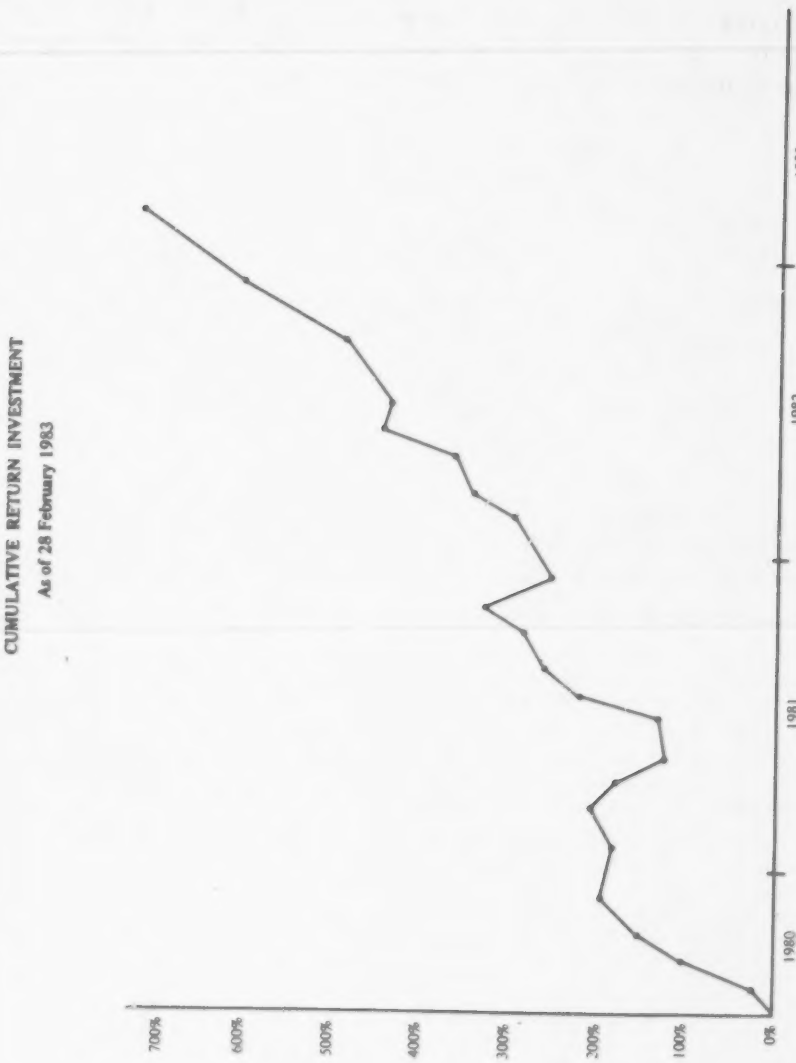

CUMULATIVE RETURN INVESTMENT
As of 28 February 1983
700%
600%
500%
400%
300%
200%
100%
0%
1980
1981
1982
1983

Figure 3

Mr. VOLKMER. Thank you very much.
Mr. Spann, you may proceed with your statement or summarize.
[The biographical sketch of Mr. Spann follows:]

biographical sketch

G. William Spann

CURRENT RESPONSIBILITIES

METRICS, INC.	President and Director	1978 - Present
	Vice President and Director	1973 - 1978

At METRICS, INC., is responsible for overall corporate planning, financial control, and assuring the availability of resources to meet client needs, and provides consulting services for a broad range of managerial, market research, and engineering tasks. Areas of specialization include remote sensing technology, economic analysis, domestic and international market research studies for technical products and services, feasibility studies, and technological environmental scanning.

OTHER EXPERIENCE

Engineering Experiment Station Georgia Institute of Technology	Research Scientist	1970 - 1975
Martin Marietta Corporation	Engineer	1968 - 1970

At the Engineering Experiment Station, directed projects and conducted seminars dealing with the use of remote sensing data for land use mapping, plant disease detection, and environmental impact analyses. Other projects included design of a marketing information system, definition of the potential market for EES research services, system analyses, economic studies, and energy studies.

At Martin Marietta Corporation, performed systems analyses using digital computer simulations and mathematical analyses to determine the performance of various physical systems; designed, coded, and tested computer programs.

Mr. Spann has served as a consultant to California Institute of Technology, Georgia Institute of Technology, NASA, NOAA, Ford, Control Data, Comsat, Gulf and others in the areas of remote sensing, marketing, market research, and technological environmental scanning.

Mr. Spann is a licensed amateur radio operator and a licensed private pilot.

EDUCATION

B.S. Physics, Georgia Institute of Technology (with Honor)	1968
M.S. Physics, Georgia Institute of Technology	1970
M.S. Industrial Management, Georgia Institute of Technology	1973

HONORS AND PROFESSIONAL ASSOCIATIONS

Selected for the award of Best Undergraduate Research Project in 1968 by the Georgia Academy of Sciences

Appointed to the Georgia Energy Policy Council and the Georgia Metrication Council

Member of the NASA Landsat Application Survey Group for Landsat Follow-On (Land Inventory); Chairman of Subgroup on Information and Management Systems

G. William Spann, p. 2 METRICS, INC.

Listed in WHO'S WHO IN THE SOUTH & SOUTHWEST AND DICTIONARY OF INTERNATIONAL BIOGRAPHY (XIV)

Member: American Society of Photogrammetry, American Physical Society, Urban and Regional Information Systems Association, Tau Beta Pi (Engineering Honorary), Phi Kappa Phi (Scholastic Honorary), and Sigma Pi Sigma (Physics Honorary)
Former Member: Atlanta Jaycees

MAJOR REPORTS AND PUBLICATIONS

1. "Space Vehicle Electrical Power Systems Study," Final Technical Report, Contract NAS8-25192, September 1971, coauthor.
2. "Computational Reliability of Least-Squares Regression Accuracy Tests," Paper presented at the 1972 American Statistical Association Conference, Montreal, Ontario, Canada, coauthor.
3. "Infrared Photography of Peach Short-Life Sites," Proceedings of the Fourth Biennial Workshop on Color Aerial Photography in the Plant Sciences, University of Maine, Orono, July 10-12, 1973, coauthor.
4. "Environmental Implications of New Energy Sources," in The Energy Problem and Its Implications for Georgia prepared by the Georgia Center for Technology Forecasting and Assessment, November 1, 1973, coauthor.
5. "Computer Land Use Mapping from ERTS," Final Technical Report, Georgia Institute of Technology, Project A-1557, March 25, 1974, coauthor.
6. "Remote Sensing Technology Transfer," Final Technical Report, Georgia Institute of Technology, Project E-240-901, July 15, 1974.
7. "The Energy Problem - A Plan for Georgia's Future," by the Georgia Center for Technology Forecasting and Assessment, July 1, 1974, contributor.
8. "Proposed Aerial Photomapping Program for (a large urban) County," Final Report, August 26, 1974.
9. "Use of Remote Sensing Data for Land Use Mapping," Final Report, Prepared for the Atlanta Regional Commission; December, 1974.
10. "Study of the USGS/NASA Land Use Classification System," Proceedings of the Symposium on Utilization of Remote Sensing Data in the Southeastern United States, University of Georgia, Athens, January 29-30, 1974, coauthor.
11. "Regional Land Use Mapping Using Automatic Processing of Remote Sensing Data," Proceedings of the Symposium on Utilization of Remote Sensing Data in the Southeastern United States, University of Georgia, Athens, January 29-30, 1975, coauthor.
12. "Study of the USGS/NASA Land Use Classification System," Final Technical Report, Georgia Institute of Technology, Contract NAS8-30653, March 1975.
13. "Land Use, Remote Sensing, and Computers," Invited paper presented at the Third Annual Seminar in Remote Sensing, University of Southern Mississippi, Hattiesburg, April 11, 1975.
14. "Remote Sensing Technology Transfer to the Public Sector," paper presented at the NATO Advanced Study Institute of Technology Transfer, Les Arcs - Bourg St. Maurice, France, June 25, 1975, coauthor.
15. "Geographic and Natural Resources Information System Feasibility Investigation for South Carolina," Final Report, Prepared for the Office of the Governor, Division of Administration, June 1975, coauthor.

MAJOR REPORTS AND PUBLICATIONS

16. "A Systems Approach to Land Use Inventories and Information Systems," Computers, Local Government, and Productivity, Proceedings of the Urban and Regional Information Systems Association (URISA) Symposium, Seattle, Washington, August 24-28, 1975.
17. "Land Use Change Detection Using Landsat Data," Report prepared for the Atlanta Regional Commission, December 1975.
18. Remote Sensing Market Survey, METRICS, INC., December 1975, coauthor.
19. "Utilization of Infrared Imagery in Studying Peachtree Decline in Georgia," Proceedings of the Fifth Annual Remote Sensing of Earth Resources Conference, University of Tennessee Space Institute, Tullahoma, Tennessee, March 29-31, 1976, coauthor.
20. "Survey of Remote Sensing Products and Services," Paper presented at The Fifth Annual Remote Sensing of Earth Resources Conference, University of Tennessee Space Institute, Tullahoma, Tennessee, March 29-31, 1976, coauthor.
21. "Land Use Change Detection from Computer Processed Landsat Data," Information Systems as Services to Citizens, Proceedings of the Urban and Regional Information Systems Association (URISA) Symposium, Atlanta, Georgia, August 27-September 1, 1976, coauthor.
22. "Cost Accounting Methods for Information Services," Paper presented at Engineering Foundation Conference on Technology, Management and Economics of Information Centers and Services, Easton, Maryland, August 29-September 3, 1976.
23. Development of an Energy Reporting System for the Maritime Industry, Phase I Report, METRICS, INC., U.S. Department of Commerce Contract 6-38035, September 1976, coauthor.
24. Landsat Follow-on: A Report of the Applications Survey Group, Vol. I & II, NASA Technical Memorandum 33-803, Jet Propulsion Laboratory, California Institute of Technology, December 1976, coauthor.
25. Feasibility Study of a Landsat Digital Data Processing Facility, December 1976 (confidential client).
26. Survey of World Remote Sensing Markets, January 1977 (confidential client).
27. Development of Cost Benefit Methodology for Scientific and Technical Information Communication and Application to Information Analysis Centers, Final Report, NSF Grant SIS 75-12741, METRICS, INC., Division of Science Information, National Science Foundation, February 1977, coauthor.
28. Development of an Energy Reporting System for the Maritime Industry, Phase II Report, METRICS, INC., U.S. Department of Commerce (Maritime Administration) Contract 6-38035, March 1977, coauthor.
29. "Indicators of International Remote Sensing Activities," Proceedings of the Eleventh International Symposium on Remote Sensing of Environment, Ann Arbor, Michigan, April 25-29, 1977.
30. International Remote Sensing Activities, METRICS, INC., May 1977.
31. Landsat Information for State Planning, Final Technical Report for NASA/MSFC, Contract Number NAS8-30653, June 1977, coauthor.
32. "Future Use of Digital Remote Sensing Data," Paper presented at The MSFC/UAH Data Management Symposium, Huntsville, Alabama, October 1977, coauthor.
33. Evaluation of Maritime Industry Energy Consumption Profiles, Final Technical Report for U.S. Department of Commerce, Maritime Administration, Contract Number 6-38035, December, 1977.

MAJOR REPORTS AND PUBLICATIONS

34. An Economic Definition of the Nuclear Industry, Final Report for U.S. Nuclear Regulatory Commission, Contract Number NRC-12-77-190, April, 1978, coauthor.
35. "Overview of Digital Image Processing Market - Systems and Services," July, 1978 (confidential client).
36. "Low Cost Earth Resources Data Analysis Systems," Final Technical Report for NASA/MSFC, Contract Number NAS8-32397, August, 1978, coauthor.
37. "Earth Resources/Digital Image Processing Market Penetration Plan," January, 1979 (confidential client).
38. "Remote Sensing Markets in the 1980's," paper presented at the ASP-ACSM Convention, Washington, D.C., March 18-24, 1979.
39. "A Low-Cost Digital Processing System for Landsat Data," Proceedings of the Thirteenth International Symposium on Remote Sensing of Environment, Ann Arbor, Michigan, April 23-27, 1979.
40. "Design of a Low-Cost Automated Landsat Data Analysis System," Final Technical Report for NASA/MSFC, Contract Number NAS8-33136, July, 1979, coauthor.
41. Landsat Remote Sensing Market Forecast, 1979-1990, METRICS, INC., July, 1979.
42. Framework for Evaluating Stereosat Markets, September, 1979, (confidential client).
43. Characterization of Stereosat Foreign Market Segments, October, 1979, (confidential client).
44. Factors Affecting the Market for Stereosat Data, October, 1979, (confidential client).
45. "Satellite Remote Sensing Markets in the 1980's," Photogrammetric Engineering and Remote Sensing, January, 1980, pp. 65-69.
46. "Foreign Government Use of Landsat Data," prepared for National Oceanic and Atmospheric Administration/National Environmental Satellite Service, March, 1980.
47. Overview of Conferences with Non-Federal Users on U.S. Operational Land Remote Sensing Satellite Programs, Prepared for National Oceanic and Atmospheric Administration/National Environmental Satellite Service, April, 1980, coauthor.
48. Planning Document for the Second Round of Land Remote Sensing Users Conferences, Prepared for National Oceanic and Atmospheric Administration/National Environmental Satellite Service, May, 1980, coauthor.
49. Handbook for Land Remote Sensing User Requirements Management, Prepared for National Oceanic and Atmospheric Administration/National Environmental Satellite Service, June, 1980, coauthor.
50. "An Analysis of User Requirements for Operational Land Satellite Data," Proceedings of the Fifteenth International Symposium on Remote Sensing of Environment, Ann Arbor, Michigan, May, 1981, coauthor.

MAJOR REPORTS AND PUBLICATIONS

51. Large Format Camera Market Survey, October, 1981 (confidential client).
52. Forest Resource Data Base Market Study, December, 1981 (confidential client).
53. Satellite Remote Sensing Market Forecast, 1980-1990, METRICS, INC., December, 1981.
54. "User Requirements for Operational Land Satellite Data Products," Prepared for National Oceanic and Atmospheric Administration, National Earth Satellite Service, March, 1982, coauthor.

Mr. SPANN. Thank you, Mr. Chairman, and members of the committee. I will summarize.

My testimony today is very positive. I firmly believe the following: It is possible to commercialize the U.S. land satellite remote sensing program with little or no subsidy; commercialization of the land satellite program is unrelated to commercialization of the weather satellites and the only reason that the current Landsat program is not viewed as commercially viable is because the Government has not equipped itself to make the program a commercial success.

I will explain the reasons for my optimism in a moment.

First, I wish to assure you that I have no biases whatsoever concerning ownership and/or operation of the U.S. land and meteorological satellite systems, and furthermore, my expertise is in the area of markets, commercial markets, for land satellite-related data, equipment, and services.

I would like to skip to the last paragraph on page 3. It is my contention that the current Landsat program is not commercially viable because the Government has not equipped itself to make a commercial success of the program. This does not imply that the sunk costs in R&D can be recovered. It does imply that the current data sales can be made profitable enough to support all operation and maintenance costs, plus provide adequate profits for constructing new satellites.

In all probability, these new satellites would use solid-state technology, as SPOT has done, to decrease costs and increase reliability. Furthermore, they will be designed on the basis of market needs.

There are two fundamental requirements for the commercial success of any product or service. The supplier organization must have some proprietary rights in the output of its efforts. It must have a marketing program that focuses on real needs and addresses the segments of the market that are willing and able to pay to have these needs satisfied.

In the case of the current Landsat program, neither of these requirements have been met. At present, there is nothing to prevent me from buying a Landsat scene on digital tape from the EROS Data Center for $650. I can then copy this tape as many times as I choose and resell it to all interested parties for, say, $200 each. If I am able to find 10 people to buy my tape copies, I make a profit of more than $1,000 on this scene, and the Government loses more than $5,000 in revenue.

The data that my customers receive is every bit as good as that available from the EROS Data Center. Consequently, there is no reason for them to purchase data from EROS if they know of my service.

The practice of tape copying is and always has been widespread in this country. Much of it is not done for profit, but simply as a favor to a friend or as a swap for a different scene. Nevertheless, this practice renders EROS Data Center sales statistics meaningless as an indicator of the true market for Landsat data.

Furthermore, the situation is not going to change without a new Government policy toward data reproduction. No private operator

is likely to consider commercializing the system without some assurance of a proprietary interest in the data.

The second deficiency in the current program from a commercialization standpoint is the lack of a marketing program. The Government has never chosen to market Landsat data actively to those segments who are both willing and able to pay for the data on the basis of its value to them. The French have certainly not ignored marketing as part of their SPOT program. Their marketing program was begun more than 2 years in advance of the launch of SPOT.

Obviously, a marketing program is not independent of having proprietary rights to the data. It does little good to create a market for your products if a competitor can then buy your products from you and sell them for less than you are charging.

In summary, I would like to say that I firmly believe a U.S. land remote sensing program can be made commercially viable, provided someone—and it does not really matter whether it is Government or a private company—is granted a proprietary interest in land satellite data and devises a marketing program to address commercial opportunities.

It does not depend on a subsidy from the Government, but it at least anticipates that the Government will continue to buy data on the same basis as other customers. It also does not involve commercialization of the weather satellites.

Given the proper legal framework, successful commercialization of the U.S. land satellite system is a distinct possibility.

[The prepared statement of Mr. Spann follows:]

STATEMENT OF
G. WILLIAM SPANN, PRESIDENT
METRICS, INC.

BEFORE THE

SUBCOMMITTEES ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT
AND SPACE SCIENCE AND APPLICATIONS

U. S. HOUSE OF REPRESENTATIVES

JUNE 28, 1983

Mr. Chairman and Members of the Committee:

My testimony today is very positive. I firmly believe the following:

1. It is possible to commercialize the U. S. land satellite remote sensing program with little or no subsidy;
2. Commercialization of the land satellite program is unrelated to commercialization of the weather satellite program; and
3. The only reason that the current Landsat program is not viewed as commercially viable is because the government has not equipped itself to make the program a commercial success.

I will explain the reasons for my optimism in a few minutes.

Since my testimony today will be directly opposed to most of what you have heard and will hear, I belive that I should give you some background information about me before I make my major points. First, I wish to assure you that:

1. I have no biases whatsoever concerning ownership and/or operation of the U. S. land and meteorological satellite systems; and
2. My expertise is in the area of markets -- commercial markets -- for satellite-related data, equipment, and services.

I have been involved in the Landsat program since 1972 when I worked at the Engineering Experiment Station at the Georgia Institute of Technology. I have been conducting Landsat-related market research and user needs studies at METRICS since 1975. In 1976 I served on the NASA/JPL Applications Survey Group for Landsat Follow-on (now Landsat 4). In 1979 I conducted the Landsat market study for NASA as part of the Private Sector Involvement Study. In 1981 and 1982 I assisted NOAA in conducting its public meetings and in supplying data for the transition plan and other Landsat planning activities. In both years, I designed and analyzed the survey instrument that requested data on the needs of users for satellite data and their willingness to pay for it.

On the commercial side of my activities, I published the Remote Sensing Market Survey in 1975, interpreting the results of my privately financed market survey. This study was followed in 1977 by International Remote Sensing Activities -- a world-wide evaluation of the use of remotely sensed satellite data. In 1979 I published the Landsat Remote Sensing Market Forecast, 1979-1990. This publication forecast the market for Landsat data, equipment, and services through 1990 and was based on an analysis of historical trends and anticipated future events. This publication was subsequently updated and broadened to include the possibility of other satellite sensors in 1981 in my Satellite Remote Sensing Market Forecast, 1980-1990. All of these forecasts have been sold to multiple clients worldwide who are interested in some aspect of the land satellite market.

In addition to the above, I have conducted numerous market studies for private clients who are interested in the commercial aspects of the land satellite system. These studies have included the evaluation of digital

image processing equipment and services markets, forecasts of the potential market for stereoscopic satellite data, and the feasibility of a commercial venture to obtain imagery from orbiting camera systems. All of these studies have focused on markets and future market potential.

The above comments are intended to relay the nature of my experience so that you will appreciate the specific market orientation of my work. You will also notice that I have done considerable work for both government and private clients. Hence, I have no vested interest in whether or not the U. S. land and meteorological satellite programs are commercialized. My future business does not even depend specifically on the U. S. having a land satellite program as long as some country or private entity has such a program. I point this out to you because it may not apply to many of the companies who responded to NOAA's request for information as well as to many of the witnesses you have heard and will hear. A number of them may depend on continued government ownership and/or operation of the U. S. land satellite system for hardware procurements and/or subsidized data prices.

I feel the above background information is necessary to establish the nature of my perspective on commercialization. My opinions are based solely on many years of analysis of the commercial aspects of land satellite remote sensing.

It is my contention that the current Landsat program is not commercially viable because the government has not equipped itself to make a commercial success of the program. This does not imply that the sunk costs in R & D can be recovered. It does imply that current data sales can be made profitable enough to support all operation and maintenance costs plus provide adequate profits for constructing new satellites. In all

probability these new satellites would use solid state technology (as SPOT has done) to decrease costs and increase reliability. Furthermore, they will be designed on the basis of market needs.

There are two fundamental requirements for the commercial success of any product or service. First the supplier organization must have some proprietary rights in the output of its efforts. Second, it must have a marketing program that focuses on real needs and addresses the segments of the market that are willing and able to pay to have these needs satisfied. In the case of the current Landsat program, neither of these requirements have been met.

At present there is nothing to prevent me from buying a Landsat scene on digital tape from the EROS Data Center for $650. I can then copy this tape as many times as I choose and resell it to all interested parties for, say, $200 each. If I am able to find 10 people to buy my tape copies, I make a profit of more than $1000 on this scene and the government loses over $5000 in revenue. The data that my customers receive is every bit as good as that available from the EROS Data Center. Consequently, there is no reason for them to purchase data from EROS if they know of my service.

The practice of tape copying is and always has been wide spread in this country. Much of it is not done for profit but simply as a favor to a friend or as a swap for a different scene. Nevertheless, this practice renders EROS Data Center sales statistics meaningless as an indicator of the true market for Landsat data. Furthermore, the situation is not going to change without a new government policy toward data reproduction. No private operator is likely to consider commercializing the system without some assurance of a proprietary interest in the data.

The second deficiency in the current program from a commercialization standpoint is the lack of a marketing program. The government has never chosen to market Landsat data actively to those segments who are both willing and able to pay for the data on the basis of its value to them. The French have certainly not ignored marketing as part of their SPOT program. Their marketing program was begun more than two years in advance of the launch of SPOT.

Obviously a marketing program is not independent of having proprietary rights to the data. It does little good to create a market for your products if a competitor can then buy your products from you and sell them for less than you are charging.

In summary, I would like to say that I firmly believe a U. S. land remote sensing program can be made commercially viable provided someone (government or a private company) is granted a proprietary interest in land satellite data and devises a marketing program to address commercial opportunities. It does not depend on a subsidy from the government, but it is anticipated that the government will buy data on the same basis as other customers. It also does not involve commercialization of the weather satellites. Given the proper legal framework, however, successful commercialization of the U. S. land satellite system is a distinct possibility.

Mr. VOLKMER. Thank you very much, Mr. Spann. We will now proceed with questions under the 5-minute rule.

Does the gentleman from California have any questions?

Mr. BROWN. Mr. Spann, since you are the only optimist in the group, could you elucidate a mechanism by which the proprietary rights to the scenes could be protected; could it be, say, through a copyright provision or something of that sort?

Mr. SPANN. I would assume it would be something similar to the copyright laws if the current copyright laws do not apply. It may only be necessary to apply the current copyright laws.

Mr. BROWN. Well, it could also be done by the simple expedient of entering into a contract with each buyer that he does not duplicate the scene and sell it to somebody else.

Mr. SPANN. A licensing arrangment of some sort?

Mr. BROWN. Yes.

Mr. SPANN. That is really not my area of expertise, but anything that does provide these proprietary rights would be acceptable to most operators, I would assume, whether it is copyright or licensing or whatever.

Mr. BROWN. What you are saying is that not only has the Government not sought to protect this exclusivity that they have, but they have not done anything to go out and actually develop a market, which means that you have to analyze users, see if the product meets their needs, and convince them—if you are convinced—convince them that they ought to be willing to pay a certain amount for something that meets their needs.

We are not doing that at the present time?

Mr. SPANN. To my knowledge, no one in Government is authorized to do anything in the nature of marketing the data.

Mr. BROWN. Thank you very much.

I have no further questions.

Mr. VOLKMER. The gentleman from New York, Mr. Scheuer.

Mr. SCHEUER. Thank you, Mr. Chairman.

I would like to ask Mr. Porter and Mr. Spann what type of proprietary rights you think should be granted to any U.S. private owner or operator of a land remote sensing system.

There seems to be some disagreement here. Maybe you can sharpen it up.

Mr. SPANN. Perhaps it is just my lack of knowledge of the legal system, but basically, if you can copyright the data or somehow prevent the people to whom you sell the data from reselling it in its original form, that would seem adequate to me.

Now, having a proprietary interest does not mean necessarily discriminatory pricing. You are still free to sell it to all comers at your established price list. It is just that once someone buys it from you, they cannot turn around and undercut your market by reselling it to someone else.

Mr. SCHEUER. Mr. Porter.

Mr. PORTER. I would agree with that. What I am trying to do is to draw the line in terms of where the value comes to the customer. If one draws the line, as the Government does now, cutting their business, at supplying the raw data, then the only thing they can do is to raise additional revenue either to market more aggressively or protect the copyrights that they have in that data.

I think that the Government has, because of uncertainty in its policy, inhibited the development of the value-added service industry. It has raised questions as to how far the Government was going to go into business; questions as to how much enhancement it was going to provide in the images that they provide for the general public.

It has been very difficult for industry to be aggressive and to step in because they have not known whether tomorrow the Government would decide to compete with them. I think a clear policy is important.

I think that value added in service industry is really the driving marketing force.

Mr. SCHEUER. Can I ask Dr. Sheffield to give us any thoughts he may have; what the result would be of selling?

Mr. SHEFFIELD. I believe you could try and sell raw data from now until doomsday; you would not make the program profitable. The program will only become profitable when it is combined with other data. That is also when you begin to lose any copyright protection that you had.

So I do not think the answer can lie in simply copyrighting products from the U.S. Data Center. If you are looking for the program eventually to generate profits, you have to look at products that are worth something. The raw products are not worth enough.

When you combine Landsat data with demographic data or geology data or other crop forecasting data, you have something people will buy. By that time, you have lost your proprietary protection. I think that is reality. I do not think copyrighting it will get you there. It might give a small increase over present revenues, but it will not make you a profitable Landsat program.

Mr. SCHEUER. Mr. Chairman, the time is getting late and I think we all have questions, so I would ask unanimous consent that we could submit questions in writing for the witnesses and perhaps hold the record open for a week or 10 days and give them sufficient time to get their answers in.

Mr. VOLKMER. Without objection, so ordered.

You have no further questions?

Mr. SCHEUER. No further questions.

Mr. VOLKMER. I now recognize the gentleman from New Jersey, Mr. Torricelli.

Mr. TORRICELLI. Thank you, Mr. Chairman.

Mr. Sheffield, I am interested in your comments concerning the potential or lack thereof for profitability here. Would it be the case with either of these programs that, in fact, the only way for a private corporation to in the short term generate any profit was merely going to be because the Government is going to have to enter into long-term contracts at high rates to purchase all current information?

So it is really going to end up being the Government subsidization of what is only in the barest terms private ownership. Is that a fair analysis?

Mr. SHEFFIELD. Quite the contrary. I think the best way to answer that is to ask Mr. Porter to cite one or two of the cases that we know of in which significant profits can be generated from re-

motely sensed data. But it is not through the widespread sale to everybody you can find. It is through very focused applications.

Would you like to say something on those, Bob?

Mr. PORTER. Thank you.

In the fuller statement which I submitted to the committee, I gave two examples. One of those examples was an instance in which we were involved in applying a proprietary technique which resulted in the discovery of a $100 million oil field.

Now, when you look at that case, the fee we received was essentially a fee for covering the costs we incurred in preparing that report. On the other hand, the profit that we will make out of it comes from the overriding royalty interest which we will obtain as an additional consideration.

Mr. TORRICELLI. Knowing the market as you do, how would you see this settling down over time? How much of the revenues of either of these programs would end up being generated from Government contracts?

Mr. PORTER. The point I am trying to make is this, that the Government, in a certain sense, has a 50-percent override on all the profits of anyone who uses the data successfully. When I am talking about a $100 million oil field, I am talking about a very small stream of benefits to my company that would readily be identified as benefits in the conventional cost/benefit sense of the word.

On the other hand, if you look at it from the standpoint of the person who has found the oil, and if you look at it from the standpoint of the dollar benefits to the Government as a result of the profitability of that, it is very significant.

Mr. TORRICELLI. I understand it if you take it more remotely, but in the actual first sales, you all are more familiar with the market for this material than I, how much of that initial sale of information, first-sale, is going to end up being right back to the Government again?

Mr. PORTER. In our case, most of our work is done with private industries.

Mr. TORRICELLI. You do not have a feel for that?

Mr. PORTER. Charles, you may want to address that point.

Mr. SHEFFIELD. If I understand your question correctly, I do not believe you can trace most final revenues benefits directly back to the Government. If you look at the cost/benefit studies, which tell you how much the Government gets back for direct sales of data, it is not very much.

You have to go to the secondary and tertiary returns before you get significant amounts of money. The problem there is, how do you track it and how do you attribute it to the Landsat program? To give you an analogy, people all over the country, every day, use census data; but to track that back to direct sales from the Census Bureau to people that are buying census data is meaningless. That is not where the benefits lie.

I do not think you can do it with Landsat, either. I think further studies or analyses of that type just do not get you there. You have to look several stages away from the raw data before you even begin to see these hidden benefits.

Mr. TORRICELLI. Let me ask a different question. I noticed in—Mr. Greenberg, I believe, when I read your written statement—

that was on remote users, small parts of the market. If I read you correctly—I think it was your statement—the concern about people either in remote areas or small areas, that it would no longer be profitable to operate a system, to focus a system, to market because of the size of that.

Whereas, now, for small agricultural use or small industrial use, it might make sense; when you have to market this, they are going to become victims. Can you give us examples or a scale at which people or small parts of the market might suffer because of that?

Mr. GREENBERG. I do not think that was in my report, because I do not think we got into that area at all.

Mr. TORRICELLI. It was in one of your statements.

Mr. Porter, was it in your statement?

Mr. PORTER. Charles, would you speak to that?

Mr. SHEFFIELD. Yes. We are an example, I think. It is quite likely that when the really big players enter this technology, small companies, or relatively small ones such as Earth Satellite Corp., will be squeezed out because of the amount of capital available to make these profitable investments.

From that point of view, if you get to a program in which only the provider decides what the price should be, then only the big players can afford to buy data. You come to the situation that Mr. Porter suggested was one possibility in his statement, which is the case where very profitable and very focused applications control all the market. Unless the Government is in there to provide for emerging markets and for research and development interests, then you will not have anything but those focused uses.

You might have half a dozen very profitable, very proprietary applications using data for which they are willing to pay a lot of money, but everyone else who might be developing in 10 years' time will be squeezed out.

Mr. TORRICELLI. Or pushed out of it completely.

Mr. SHEFFIELD. Right.

Mr. TORRICELLI. Thank you.

Mr. VOLKMER. I now recognize the gentleman from Texas, Mr. Andrews.

Mr. ANDREWS. Thank you, Mr. Chairman.

I would just like to follow up on that, Dr. Sheffield. Is it your position that you say the small players will be squeezed out in a free market system like that? Is that what I understand your testimony to be?

Mr. SHEFFIELD. Not quite that. What I am saying is that today, you have many, many emerging uses. We happen to know a handful that are already profitable. If you want to see those small users continue to grow and become, 10 to 15 years from now, potentially significant users and potentially very large markets making a lot of money, then you have to provide a continuing data stream to them.

If you go for a system in which you, commercialize it, and the price of data becomes very high so that only a few very wealthy groups are still in the game, you will not see the emergence of the new uses 10 to 15 years from now.

What you are doing by limiting the distribution of data is making it less interesting for small users to keep using it, to learn

more about it, and eventually, perharps a decade from now, to find out that it is very valuable in some new application.

I am arguing that you need to keep widespread distribution of data if you wish to encourage new markets, especially the small ones.

Mr. ANDREWS. You do not think just the free market system will take care of that to some degree? New companies, as they are successful, as they find investors, as they gain credibility to raise the necessary funds, will be able to participate?

Mr. SHEFFIELD. I think it very much depends on how you commercialize it and what freedoms you give to the operator, or owner/operator, as to whether or not that would happen.

Mr. ANDREWS. Enumerate a few. What, in your opinion, would be some of the freedoms that you would have to get?

Mr. SHEFFIELD. Well, for instance, if you have an owner/operator, I think you would have to say to that owner/operator that you are restricted from going into value-added markets; because if you permit that, then the owner/operator will naturally go into the most profitable value-added markets that can be found.

Mr. ANDREWS. What is wrong with that?

Mr. SHEFFIELD. Nothing is wrong with it, except that they will focus only on that, because it is where the short-term profits are. I do not believe that you will encourage the long-term research, which is also a component here, as was said in Mr. Porter's statement. We are looking at a technology that is in its infancy.

If you want the technology to grow, you have to keep looking for new applications. But the short-term profits are not in that business; they are not in the research end, or the development end. They are in the "where can we make some money now" end. There is nothing wrong with that, but I believe you must keep a component, perhaps a Government component, of a research program which still allows people to go on looking for new applications.

Mr. ANDREWS. Let me use a simplistic analogy, and I apologize, I did not hear your testimony, but are we not in the same stage as we were back in the early 1900's and late 1890's with the advent and the invention of the automobile? Are there not some similarities there between the entrepreneurs of those days and what they elected to do and the risk they took and the failures that some of them suffered and the successes that were there in terms of their long-range planning and their short-range profit motives?

Mr. SHEFFIELD. I think the difference is that in order to play the game, in order to become a small producer of an automobile, you must have access to the remotely-sensed data. If a system evolves which permits that to continue, then your analogy is fine.

But if it turns out that your garage mechanic cannot afford the data, or cannot get his hands on the data, then the analogy collapses; which is why I say, if you want to encourage the long-term use, then you must also encourage a program which permits data to be available at reasonable cost to everyone.

That is not necessarily the way in which a company which took over the system would make money. It would go for the short-term, highly leveraged applications and might never get to the widespread distribution of data. There is no profit incentive. You cannot make much money selling raw data, as we have said before.

If you cannot make much money selling raw data and you are in the business for a profit, then you will not worry about that end. But if you can assure the continuity of raw data, then I have no objection at all to other people making substantial profits. That is fine. But you need a program with both components.

Mr. ANDREWS. Failing, too.

Mr. SHEFFIELD. Sure, OK. That is a right of our system, too; you do not have to succeed.

Mr. ANDREWS. Mr. Chairman, I have some written questions that I will submit later, but I will pass here.

Mr. VOLKMER. We will have the record open and provide them to staff. They will be sure that they get submitted to the witnesses.

Mr. ANDREWS. Thank you.

Mr. VOLKMER. The Chair will now recognize the gentleman from Pennsylvania.

Mr. WALKER. Thank you, Mr. Chairman.

I, too, am concerned about some of the things I hear in this committee whenever we get to talking about commercialization from witnesses and from other members because it seems to me that what I begin to hear is the fact that the best solution for some of our industries of the future is that socialism if Government simply controls this, thereby we will eventually have Government helping all the small people and all the little guys and so on—well, that is socialism.

It seems to me that there is some advantage to the free market in some of these things because the fact is that Government has no imagination. Government has no idea what the future might be and the people with imagination are somewhere outside of Government. I think that what we have got to be all about here is making certain that those people with imagination have some access to all of this, too. While I agree that there may be a very little bit of profit to be made in furnishing raw data initially, it could be that when people begin to recognize the value of that raw data in the future, there could be considerable profits connected with it.

I submit that there are some utilities around this country that are making an awful lot of money supplying raw power out there for application. We may have to set up the utility syndrome of the future.

Along those lines, Mr. Spann, I am wondering, do you think that there is sufficient profit to be made out there that if we do not commercialize this, that we will face foreign competition, or some other kind of competition at some point in the future because there is the kind of market that will inspire others to get in where we fail?

Mr. SPANN. Absolutely. If we do not do something, the foreign market will probably take over. I disagree totally with the scenario presented by some of the other people here. I believe there is a profit to be made on selling the raw data. If the raw data helps me find a $100 million oil field, I do not see any reason on Earth why I should not pay more than $200 or $650 for a scene to help me find that oil field.

On the other hand, if some operator is required to sell data to all comers on a nondiscriminatory basis, there is no reason on Earth why they should not also be allowed to be in the value-added busi-

ness. They cannot possibly do everything. They will only choose to do a few things. They have to sell data to their competitors on the same basis that they buy it from themselves in effect, so there is plenty of room for multiple competitors, even if the operator is allowed to add value-added services.

Nobody has the expertise to provide to all of the possible value-added services that will be required.

Furthermore, I do not believe that the small types will be squeezed out. It may have to come to something like a wholesale/retail arrangement that is standard commercial practice in this country among many companies, but I do not believe that just the fact that there is a private operator that—maybe he also incidentally provides some value-added services—I do not see how this is going to squeeze anybody out necessarily.

Mr. WALKER. The fact is, he would be somewhat encouraged to come up with all kinds of value-added services if he has that kind of data to disseminate because his value-added services would become someone else's ideas for more value-added services that then they would have to come to him to buy the raw data.

Is that not a likely scenario?

Mr. SPANN. Assuming he is not losing money selling the data, and there is no reason to expect that he would, then certainly the more people out there with more different applications, the more data they are going to buy from him, and he is perfectly happy to let them make their profit doing the other value-added type activities.

Mr. WALKER. Then there is no incentive, really, for Government to come up with ideas for value-added services. We do it almost incidentally. We have no real incentive to do that and someone who had the need to sell that data as a profitable aspect of their company would have considerable incentive to come up with the kinds of concepts that would utilize that data more widely and more valuably?

Is that not a reasonable scenario?

Mr. SPANN. Yes; that is how the country works.

Mr. WALKER. Thank you, Mr. Chairman.

Mr. VOLKMER. The Chair will now recognize the gentleman from Florida, Mr. Nelson.

Mr. NELSON. Thank you, Mr. Chairman.

I would like to address this to any of the gentlemen on the panel. We appreciate your being here today.

Basically, do you think that the commercialization of weather satellites makes sense, and if so, under what conditions?

Mr. VOLKMER. Anybody want to start? Do you want to start there?

Mr. PORTER. Charles, do you want to comment on weather?

Mr. SHEFFIELD. I consider myself unqualified so I am going to have to pass. I think you may get four passes out of this one.

Mr. PORTER. I pass.

Mr. SPANN. I only see one customer for about 97 percent of the data, so I do not really know why anybody would want it.

Mr. NELSON. Which is that customer?

Mr. SPANN. The National Weather Service.

Mr. GREENBERG. I do not feel qualified to contribute any more than the others.

Mr. NELSON. Well, that is pretty strong testimony for my position with regard to the commercialization of weather satellites.

OK. Let me try another one. You all have talked about the financial aspects of commercializing the Landsat. The fact that it is presently controlled by the Government; there is a certain public good if we will talk about that that is held for the interest of the public.

Now, were that to be released from the control of the public through the Government, do you think there would be a lessening of the public good? Any of you want to comment on that?

The public good—well, let me just stop there and I will refine it as you go along. Go ahead.

Mr. GREENBERG. I will comment on it since I have not made any previous comments. I think probably there would be because the objective of Government is normally—or should normally be—to try to maximize the public good, maximize the benefits to the public.

The private sector, on the other hand, is concerned primarily with maximizing profits. The benefits to the private sector are measured in the form of profits.

Quite frequently, the motive of profit maximization and benefit maximization are not the same and they can diverge very, very significantly. I think in my written testimony I gave an example of that having to do with improved communications to emergency medical services in the nonmetropolitan U.S. areas where thousands of lives per year could probably be saved by improved communications.

But so far, no private sector organization has undertaken to provide a service because the benefits can only be measured as a portion of the revenue generated from telephone calls and there is no way of equating the price of a telephone call with the value of a life saved. So you sort of have divergent approaches here.

I think the same thing happens in the land remote sensing area. There are areas which are, let's say, in the public good, information having to do with improved forecasting of wheat acreage and yield, improved knowledge of snow melt runoff and the effect on the rivers and the resultant flooding. Those can only be measured in the public good, and there may be little way of establishing a direct pricing mechanism which the private sector can then capture.

Mr. SPANN. Well, I am sure that that could happen, but I do not necessarily see that it has to. If it is a public good to provide river forecasts, then the Government will buy data and massage it to the extent that it needs to get a river forecast, I believe.

Mr. PORTER. I guess I feel that the public good is going to be best served for the people of the United States if we have an ongoing technology which is competitive. That is the bottom line.

That technology should be available to U.S. industry. I am concerned that the way the programs are going now, that an aggressive program is not going to be undertaken, either in the public or the private sector, that is going to provide a high quality, state of the art information, to the public so that it can be developed.

I am absolutely convinced that 10 or 15 years from now, we are going to look on this as a major basis of national and international power. There is just no question in my mind.

In fact, I am very surprised that there does not seem to be more concern with this point.

Mr. NELSON. You might have already answered this, but let me ask you. In your opinion, how soon must we act in order to insure that we retain that capability and also that we remain internationally competitive?

Mr. PORTER. I think there are several things that we need to do right now. I think one of the purposes of these hearings is to get this issue of commercialization up or down so that the Government knows where it is going and it can either fund programs or not fund programs so industry can make a commitment.

The other great loss I feel right now is that we have 6,000 scenes of Landsat data taken over the United States and Canada with the state-of-the-art mapper camera. The throughput of Sioux Falls is now one scene a day. We have got to get money appropriated in order to get this data out into the public domain in some way and let the users start to develop the models that will give value to that data.

There is a tremendous amount of enhanced value that occurs after the time the data is out in the public domain and is studied and applications models are developed. Until you do that, the clock has not started to run on the benefits that you are going to receive.

Mr. GREENBERG. Could I add to that for a minute?

Mr. NELSON. Sure.

Mr. GREENBERG. Right now, we have an ailing Landsat D′ in orbit. We have a Landsat D′ as a spare for that. Landsat D, my guess is, will fail in the not too distant future. We are faced with, then, with replacing Landsat D.

When the replacement satellite D′ is launched, there is no guarantee that we will have a launch success. There is no guarantee—if we do have a launch success—that it D′ will outlive Landsat D. It takes, on the other hand, 3 to 4 years normally to procure and have ready for launch another satellite. That means that we are right now in an extremely precarious position with respect to achieving a continuity of data for the next several years. We may be faced with a real problem in the near future where we have just, by default, turned things over to the SPOT system.

Mr. NELSON. Dr. Sheffield.

Mr. SHEFFIELD. A very brief comment. There are very big public-good components to the Landsat program which can never be realized if we do not have a program. To me, the most urgent question is not whether or not we commercialize, it is what do we do while we are deciding. Delay is the deadliest form of denial, and the clock keeps on ticking. The most urgent priority is to make sure that if we take 3 years or 1 year or 10 years to decide when we turn the system over to private operation, we still have a system going, when the decision is made because the surest way to lose your potential users is to keep turning the system on and off.

It is like a bus service; if the bus only comes randomly every few days, you never become a regular user. So, to realize the public

good that I think is there, we must guarantee some continuity of program.

Mr. NELSON. Thank you, Mr. Chairman.

Mr. VOLKMER. Thank you. I now recognize the gentleman from Washington, Mr. Chandler.

Mr. CHANDLER. I have no questions, Mr. Chairman.

Mr. VOLKMER. All right, the lady from Rhode Island, Mrs. Schneider.

Mrs. SCHNEIDER. I have no questions at this time.

Mr. VOLKMER. All right. I have a few questions.

Mr. Spann, in your testimony on page 4, you provide two fundamental requirements for commercial success of any product or service. First, prioritization must have some proprietary right in the output of its efforts; the second, it must have a marketing program to focus on real needs and address a segment of the market willing and able to pay to have these needs satisfied.

Does that apply to the Metsat, the weather satellites also?

Mr. SPANN. Well, that is not really my area of expertise, but if, in fact, you are going to commercialize the weather satellite, that certainly has to be true. Like I say, with only one major customer that buys something over 95 percent of the data, I see that as a totally different problem. But that is not my area of expertise.

Mr. VOLKMER. Is there anybody on the panel that feels that we do not need to continue on with a land remote sensing program in this country, that we can turn it over to France or anybody else without any problems to this country, economic, social or anything else?

[No response.]

Mr. VOLKMER. So from your silence, I feel that that is not the way to go, then.

The next question, then, that I have is, Mr. Porter, you talked a little bit about the possibilities of commercialization for land remote-sensing through finding oil deposits or other natural resources, mineral, et cetera. You yourself do not commercialize, or do you, the oilfield?

Mr. PORTER. What do you mean, would you restate your question? Do you mean do we participate in the exploration process ourselves?

Mr. VOLKMER. Yes, and the finding and then development of the oilfield?

Mr. PORTER. Yes, we enter into partnerships with different oil companies and define a geographical area in which we will have an exclusive relationship with one company or another. Then we will share in the profits on a basis which we have negotiated with those companies.

Mr. VOLKMER. OK.

Mr. PORTER. Does that answer your question?

Mr. VOLKMER. Yes, that answers my question.

I seem to find, as I sit here and listen, disagreement and I want to clear it up. How do we go about the commercialization? What do we need to do if we do commercialize Landsat? As I understand from Mr. Spann, you feel that if it is commercialized, whoever acquires it should have the proprietary interest in the data; is that correct?

Mr. SPANN. Yes, sir.

Mr. VOLKMER. Dr. Sheffield, you disagree with that, as I understand.

Mr. SHEFFIELD. I partly disagree with that. I am saying that they can certainly have copyright on the data, but they must also certainly continue to make it available to everyone. I am further saying that I do not think copyright will be enough to make the organization profitable.

I do not think there are enough sales of raw data to be made, whether or not it is copyrighted, to have a profitable enterprise.

Mr. VOLKMER. In other words, copyright, that includes exclusivity, then.

Mr. SHEFFIELD. That is a different thing. Proprietary rights to the data would mean that I do not have to sell it to you or you or anyone. That is a different game.

Mr. VOLKMER. You have to come to me and I will——

Mr. SHEFFIELD. You will give it to me if you want to, right. I think we are disagreeing on terms, then.

Mr. VOLKMER. In other words——

Mr. SPANN. My proprietary right equals his copyright. You still have to sell it to all comers on a nondiscriminatory basis.

Mr. VOLKMER. At what price?

Mr. SPANN. Well, you set what price the market will bear. If you——

Mr. VOLKMER. But if I go in——

Mr. SPANN. If you cannot sell it to anybody because your price is too high, then you are in real trouble.

Mr. VOLKMER. Yes, but if I go into the value-added services myself and I now have all this raw data and I go into the value-added services and start my marketing system, and nobody else can get any information from the satellite up there, now where does that put us as far as development of markets?

Mr. SPANN. I do not envision it working that way. Just because I am the operator of the system and can also provide services does not mean that he cannot come along and buy my data and compete with me with my same service or a different service.

The only thing that giving me the proprietary rights and the data does is it means that he cannot buy my tape for $1,000 and turn around and sell it to 10 people for $500.

Mr. VOLKMER. Reproduce and sell it for $1,000, or $900 each.

Mr. SPANN. Right. If he changes it, if he adds value to it, if he enhances it in some way, then it becomes his product.

Mr. VOLKMER. Then he cannot——

Mr. SPANN. He has presumably expended his R&D dollars to decide how to do it and his marketing dollars to decide what to do. Therefore, he deserves to make a profit on it also.

Mr. VOLKMER. All right. That helps me out.

Now, do any of you feel that if we had followed this type of program for the total Landsat program, satellite on down, that it would be commercially viable within the next 5 years? Yes or no.

Mr. SPANN. I do not believe it would take that long.

Mr. VOLKMER. You think it would be commercially viable?

Mr. GREENBERG. I have to disagree with the gentleman to my right.

Mr. SHEFFIELD. Let me disagree, too.

Mr. VOLKMER. All right.

Mr. GREENBERG. We are not experts in the market area. In fact, the only thing we can say about the market forecasts that we used in our studies were that they were based upon informed judgments. To my knowledge, I find there is a very great lack of understanding of the potential market, even for the raw data, no less for value-added products.

For the raw data, I do not think we understand yet the relationship between the number of scenes sold, the price, the resolution that is required, the timeliness of the information. In other words, how do all of the product attributes affect the price that can be charged and afforded by the users? We do not know that.

We also sort of have skirted the issue this morning. We have talked about private financially viable businesses mainly having to do with value-added and selling of products, the data products. But we have not talked about the financial viability of a business venture which has to pay for the data processing, the satellites, the use of the TDRS and other communications satellites that might be necessary. That is where the very large investments come in. That is why we found that the business ventures are going to require some significant Government subsidies, for quite a number of years—perhaps the next decade. Again, we did not get into the value-added businesses. Those probably will start to develop, but it is going to take some time to really develop those on a commercial basis.

Mr. VOLKMER. Is it possible, to follow up, that you concede that the market can grow?

Mr. GREENBERG. Yes; Yes, I think the market can grow very, very sizably, but then again, would a prudent businessman invest very sizable amounts of money today in the hope that the market would grow significantly? We tried to play the role of, let's say, the prudent businessman looking at a business venture. We only had the opportunity to look at one business venture because of the short time of the study. So the remarks I make are based upon the very limited scope of the studies that we did.

The kind of studies that we did, incidentally, and I think the market studies, as well, that the other gentlemen have done, those kinds of studies should have been done, oh, probably 5 or more years ago, in direct conjunction with the overall research and development work. As soon as one starts to conceive of the notion that the Government is doing work that is going to be transferred or commercialized by the private sector, hand in hand with the research and development work on new sensors, on new data products, one should start considering the implications of that work on how you are going to transfer and how you are going to affect the private sector investment decisions. That has not been done until just recently.

Mr. VOLKMER. All right. Now, much of the data is cumulative as far as geological information. We obtain our information on topography and things like that, that is there; that does not basically change, you know, from one month to another month and one year to another year. Crops and things like that do.

Is it likely and possible that the market for Landsat-type data could possibly shrink?

Anybody have any comment on that? Dr. Sheffield?

Mr. SHEFFIELD. I do not think it will. All of our experience suggests that one-time coverage, even in the most unchanging of situations, which you would think would be geologic applications, will not be enough. There are too many other variables. You do need continued coverage, and you do need coverage with different instruments. There are instruments that we are just beginning to look at, that have never surveyed the Earth's surface. They may be the ones to produce the biggest breakthroughs in the next 5 to 10 years.

So even though we are accumulating a data base which will be very valuable, we will not squeeze it dry. We will continue to need more, and we will continue to need different instruments in orbit.

Mr. VOLKMER. Mr. Spann, do you wish to comment on that?

Mr. SPANN. I basically agree with that. If you totally saturate the Earth for a particular application, such as geology, which is one of the few that is likely to happen, then you just change the sensor. You are looking in a whole different way. You start over again.

On the other hand, there are certain applications, primarily related to renewable resources, that have not yet had a chance to develop because the data delivery was not in time for anybody to do anything useful with it.

We have not even explored that area of the market. That is a huge potential market. Its current value is approximately zero because nobody can get the data in time to do anything worthwhile.

Mr. VOLKMER. All right. Mr. Greenberg.

Mr. GREENBERG. I am in basic agreement with what has been said; yes.

Mr. VOLKMER. All right.

Now, the administration has taken the position to go forward and develop and have requests for proposals ready by September and to issue those to potential investors, either for the Landsat system or the weather system or both, and then after those come back, to evaluate them and then come up to the Congress for legislation.

Do you have any opinion as to whether or not investors would be willing to make those investments they have to make in order to reply to a request for proposal and to make the proposal without knowing what the Congress is going to do?

Anybody ever think of that?

Mr. SHEFFIELD. I know I would not put money in.

Mr. VOLKMER. What would you do?

Mr. SHEFFIELD. I would not put a cent in until I knew what Congress was going to do. I do not think anyone else would do it either, unless they had some other reason for doing it. But looking at it as a business venture, until Congress decides whether the system is going to be turned over to private enterprise or not, why should somebody put $100,000 in as a token?

Mr. VOLKMER. How about a million or two?

Mr. SHEFFIELD. Well, I think smaller than that.

Mr. VOLKMER. OK. It is estimated that some of it might cost that much.

Mr. SHEFFIELD. I agree, it might.

Mr. VOLKMER. Do you agree on that?

Mr. SPANN. I would think that a resolution by the Congress would certainly encourage a lot more participation. I cannot say that no one would participate, but you certainly will not have full participation.

Mr. PORTER. May I just add a corollary to that?

Mr. VOLKMER. Yes.

Mr. PORTER. I think people are going to be reticent to put money into exploiting current technology until this matter gets itself resolved. So I think it is not only inhibiting decisions for future systems, but for the use and utilization of present systems.

Mr. VOLKMER. In other words, utilization and enhancement of present data?

Mr. PORTER. That is correct. I cannot emphasize enough the importance of the need for time and experience with data use in order to give that data value.

Mr. GREENBERG. I would suggest that with respect to the RFP that may be forthcoming, that the RFP consider not just the sale of various Government assets or accept proposals only for the land remote sensing or the meteorological sensing or a combination of the two, but also to consider essentially Government ownership and operation of the space and ground systems, and allow for proposals for the marketing and sale of the basic data products.

You might find in that area that you would have a significantly larger number of proposals coming in.

Mr. VOLKMER. I quite agree with you. So far, the Government does not. The Government, to this point, at least from the information that I have from the testimony, et cetera, from the Source Evaluation Board, was that they are looking at the total Landsat program, total meteorological program, or combinations of the two. I think some of us disagree with that.

Mr. GREENBERG. It is my view that the private sector can do marketing and sales best. In any event most of the money that is currently being spent on the satellite program and on the data processing—for the basic data products—is being spent in the private sector. The private sector, though, knows how to provide incentives for people to get out and beat the bushes and sell and come up with new products.

Mr. VOLKMER. If, at the present time, we had a very large market for the data and the data was being marketed successfully for the Landsat, would you agree that we would have more probability of selling the whole thing?

Mr. GREENBERG. Probably, yes.

Mr. VOLKMER. If we do proceed as suggested and in the way that you mention, marketing and the data, will we not have to proceed immediately? I think you touched on this before, getting a successor to Landsat D'?

Mr. GREENBERG. I think it is very important to demonstrate that there will be a continuity of service.

Mr. VOLKMER. Right.

Would it not be also possible that after a period—let's say it does turn out successfully—that the marketing function of the information that—maybe 5 or 6 years down the line—you may be able to also market, then, the satellites and operations?

Mr. GREENBERG. That is entirely possible if it makes reasonable business sense.

Mr. VOLKMER. Right. But right now, your opinion is that it does not?

Mr. GREENBERG. That is right.

Mr. VOLKMER. I have no further questions.

I want to thank all of you for taking time to be here. It has been very helpful to us on this.

The committee will stand adjourned, to reconvene on July 14. Thank you very much.

[Whereupon, at 11:25 a.m., the subcommittee was adjourned, to reconvene, subject to the call of the Chair.]

THE COMMERCIALIZATION OF METEOROLOGICAL AND LAND REMOTE-SENSING SATELLITES

THURSDAY, JULY 14, 1983

HOUSE OF REPRESENTATIVES, COMMITTEE ON SCIENCE AND TECHNOLOGY, SUBCOMMITTEE ON NATURAL RESOURCES AGRICULTURE RESEARCH AND ENVIRONMENT, AND SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS,

Washington, D.C.

The subcommittee met, pursuant to notice, at 2:30 p.m., in room 2325, Rayburn House Office Building, Hon. James H. Scheuer (chairman of the subcommittee) presiding.

Present: Representatives Scheuer, Volkmer, Brown, Nelson, Andrews, McGrath, Bateman, Schneider, and Lewis.

Mr. VOLKMER. The Subcommittee on Space Science and Applications and the Subcommittee on Natural Resources, Agriculture Research and Environment will come to order.

We are today continuing our hearings on the Commercialization of Civil Remote-Sensing Satellites. Previously, we have had several witnesses who have studied this issue. Now we will hear from three more.

The studies we will consider today were initiated by the administration. But we fully realize that they do not represent their administration's position. We don't want to get any of the authors in trouble by implying that their reports represent the administration.

Nevertheless, since we are going to hear about three more studies that do not support transfer of the Metsats to the private sector, one must observe that there does not seem to be much analytical support for that proposed transfer.

With respect to land remote sensing the question of commercialization is more open, because much of the use of Landsat data is for commercial purposes. Therefore, with respect to land, one important question is, how could we make the transition from a Government-funded research system to a market-driven commercial system while still maintaining our national security, international obligations, and so forth.

I want to welcome all our witnesses. I look forward to your testimony.

Beforehand, I wish to have the record show the statement following my statement of the chairman of the Subcommittee on Natural Resources, Agriculture Research and Environment, Mr. Scheuer.

I would like to have his statement entered at this point.

[Statement of Mr. Scheuer is printed in the record of the July 21, 1983 hearing on Commercialization of Remote-Sensing Satellites.]

Mr. VOLKMER. At this time, I will recognize Mr. McGrath for a statement.

Mr. MCGRATH. Thank you, Mr. Chairman.

I want to join the chairman today in welcoming our witnesses. I am particularly pleased that today we are to receive information about a business evaluation of the responses to the request for information which was issued last September.

As our witnesses may know, one of my major concerns relating to commercialization is that it be a good deal for the American taxpayer. If we choose to go forward with commercialization, we must insure that it will not end up costing more money than our present arrangement.

In addition, we must be certain that a commercial arrangement will not have an adverse impact on our national security and international relations uses of remote-sensing data.

I look forward to hearing what our witnesses have to say about the possibility of addressing these concerns in a realistic plan for commercialization.

Mr. VOLKMER. Thank you very much, Congressman McGrath.

At this time I will recognize Mr. Ceorge B. Bennett, chairman, Braxton Associates. He was a member of the President's Private Sector Survey on Cost Control—the "Grace Commission."

Mr. Bennett, you have a statement which you submitted to the committee. That statement will be made a part of the record in total. You may either summarize your statement or review it, however you so desire.

Before you proceed, I would now like to ask unanimous consent that photographs and both film and television people be permitted.

Are there any objections? Let it be so ordered.

Mr. Bennett, you may proceed.

STATEMENT OF GEORGE B. BENNETT, CHAIRMAN, BRAXTON ASSOCIATES, MEMBER OF PRESIDENT'S PRIVATE SECTOR SURVEY ON COST CONTROL, THE GRACE COMMISSION

Mr. BENNETT. I will summarize from the testimony I have submitted in writing.

As you indicated, for about 3 months last summer and intermittently since then, I have worked as an unpaid volunteer with a group that is referred to as the President's Private Sector Survey on Cost Control.

Although I am not a member of the executive committee of this Presidential task force, and therefore, cannot officially speak on behalf of that group, I did serve as a project manager for the group, leading a team of volunteers who reviewed the activities of the Department of Commerce.

In that capacity, I helped generate suggestions regarding cost reduction and revenue enhancement opportunities within the Department of Commerce, which were then processed by the President's Private Sector Survey Executive Committee, and then eventually submitted to the President.

The report which was submitted to the President is now a matter of public record, and among other things, contains suggestions regarding the commercialization of U.S. civil satellites. I have brought copies of the pages of this report which relate to the commercialization issue with me for those who are interested.

My testimony today, for the most part, will be consistent with that material. But since I cannot officially represent the President's Private Sector Survey, for the record my comments should be viewed as those of an informed, impartial citizen and businessman.

Let me comment first on land-sensing, and second on weather-sensing satellites. In the land sensing area, a lot of the testimony which I have reviewed that has been presented to this group has focused on the physical transfer of assets from the Government to private industry.

I would like to suggest that there is another emphasis that could be placed on the commercialization question that would be productive as well. That emphasis is that there is enormous uncertainty, at this moment in time, regarding the commercial value of the data generated by the Landsat system.

I think that we basically are in the circumstance now where we have said if we could sell the Landsat equipment to the private sector, they would have enormous uncertainty in terms of the value of the data they would eventually be able to sell.

A second way for the Government to proceed would be to say, it is our responsibility to make clear for the private sector what the value of the data is, and to conduct ourselves in such a way that they have some measure of that value. And if they have that, they then can respond in their own best way, be it putting up their own satellites or trying to purchase the Government's, to proceed to realize the potential of the opportunity.

I would suggest that the second process has merit to the extent that by 1988 most of the physical hardware related to at least the satellite portions of Landsat will be scrap anyway.

Let me comment on why valuing the data would be worthwhile. There are a fair number of stories in circulation.

One came from William Spann who testified before this group at the last hearing. He tells a story of a company that purchased one of the thermatic mapper maps that covered about a 100-square-mile section of the Earth. With the purchase of that one map, the section proceeded to find a $100 million coal seam. They are comfortable in admitting that it came from the fact they had the map.

Now a question you might want to pose, if you have that kind of thing happen, is what that particular company would pay for 10 more maps of 10 more high potential areas? And the second question you would have to pose is: If we as the Government are virtually giving the maps away, who would the firm go to with a loud voice saying what the data is worth to them?

I argue that the current marketing mechanisms and price structure that we have is not conducive to giving us a feeling for the value of the data, not only to our own natural resource corporations, but to those which are active in other countries as well.

Given that perspective, I have worked with the team that did the analysis at the Department of Commerce, and developed a mecha-

nism to help the Government establish what the value of that data might be. I will not elaborate at length now on that idea, but will give you the essence of it. If in the question session someone would like to have it further described, I will do that.

What we have developed is a thing that we call the Landsat pricer concept. It is simple, straightforward, and I think, easy to implement. It would be of enormous value to both the Government and to the people associated with the Landsat system.

The concept is simple. I think the Government could basically offer an RFP bid for the rights to price the Landsat data. That is, you would pay a given sum of money for the rights to set the price levels that would be charged for the various pieces of Landsat data.

I argue that if you did that, and that's a fairly paper-related process, not particularly complicated, that if there were people like the coalfield people that discovered the $100 million seam with one map, that suspected their competitors would, in fact, get the Landsat pricing right and would raise the price to the true value-in-use of the data, you would get bid prices near the value of the data. If, in fact, you split the revenue generated from the Landsat data, priced at the level the pricer sets it, 70 percent for the pricer and 30 percent for the Government, the incentive to become the pricer—price it at its true value and take the 70 percent away from your competitors who are using the data so cheaply—would be an enormous incentive.

I use vocabulary in the written testimony that says what you would do is "smoke out" the true high value in-use users, and give the commercial sector of our economy some idea what this data might be worth.

If, in fact, you priced in the manner that I suggested, there is a chance that you could demonstrate that the data as it now exists has several hundred million dollars' worth of value annually, and would generate millions, not only for the Government, but for the pricer. This would lead to commercialization, not from the sale of physical hardware, but would lead to commercialization to the extent that it would demonstrate the value of sending up private sector satellites and selling the data. Individual competitors would undoubtedly focus on various market segments and find subsets of the market that would appeal to their particular technical capabilities.

In order to implement the concept, we envision two-phase process. First we would divide the collection and dissemination of Landsat data into two pieces: That which takes place up to the storage of raw unprocessed data and the processing of the data beyond that stage.

The transferring of the activities from the raw unprocessed stage forward to the private sector should be very straightforward. The private sector is ready for it. I think you will hear testimony later today that they are equipped to take over this activity now. Private sector firms basically say that as long as the Government is processing the raw data and creating images and what they call computer compatible tape and film and giving it away, virtually for free, it is very difficult for the private sector to fully realize whatever potential the downstream value-added products represent.

I see no barriers. The private sector sees no barriers to making that segment of the process commercially available to the private sector and getting the Government out of the business. The way to commercialize the downstream activities is not to take any positive action other than to have the Government stop giving away that data.

In the earlier stage of the process, from the satellites down to the raw unprocessed form, I think the Landsat pricer concept is the way to establish whether or not the raw data has value.

Now what happens if we go through the exercise and discover the raw data does not have any value, which I think is at least as likely as the possibility that we discover it has high value. I have looked at it over several months and I am not personally convinced which side we would discover.

I think if you discovered the raw data not worth anything, then you do have to really think hard about whether or not a market which is generating somewhere between $37 million and $45 million in revenues—that's what you get if you add up all the revenues that the Government now gets and all the revenues that the people that add value now get is worth a lot of further Government subsidies.

When we have in recent years invested as a Government about $2 billion of taxpayer funds to support an industry that has only $35 million in revenues, you have to have some pretty good noneconomic reasons to keep up the subsidies.

One of those justifications that people have stated in these hearings and other places, is that the United States wants to keep its technological edge in the technology associated with remote land sensing. Without having access to the intelligence sensitive defense-related material, I have to assume that the state of technology we use in our military land sensing has to be substantially more advanced than that which we use in our commercial civil satellites.

This says to me that if you can satisfy yourself that by proper funding of military applications, that the United States can stay at an acceptable level in the technology related to land sensing, there is not a commanding need for hundreds of millions of further subsidies to support a $35 million industry.

Finally, with regard to foreign competition, I think the arguments are fairly simple and would resolve themselves under the scheme I have just outlined. If the data is not worth anything, that is, if you sold the pricing rights and no one was willing to bid the price up and pay for the raw data in any reasonable way—then that may mean you are dealing with a market that is $50 million business.

It seems to me that if that's what we have, then arguing and spending hours and hours perspiring over what the U.S. market share will be in a $50 million international business should not make it to the ranks of one of our top national priorities.

On the other hand, if we establish that in fact the markets are large, and that it is a $400 million or $500 million a year market, then I cannot believe that the U.S. companies that have been a part of the $2 billion subsidy that has been put into the U.S. capability in the last 11 years, won't be able to be world class competi-

tors and compete effectively with the French and the Japanese who are now putting some money in themselves.

With regard to weather satellites, as you all are aware, there have been arguments against commercialization ranging from the fact that the Government is the only customer to the complexity of international data transfer agreements. I guess I would just like to add my vote to the group of people who say that the penalties and complexities associated with that transfer probably far outweigh the benefits you would derive from trying to make it a private entity.

There has been an argument made, however, that perhaps linking the Landsat and the weather satellites together would lead to enough efficiencies from running them as a package, that you ought to link the two. I would just like to point out one major fallacy in that reasoning. That is, that that reasoning assumes that you have decided that you want to preserve the civil land remote sensing capability.

If you do want to preserve it, then the joint economics might in fact justify putting them together. But if you do not want civil land remote sensing, then the slight improvements of efficiency that come from combining them cannot possibly be as cheap as just not doing Government sponsored land sensing at all, or turning it over to the private sector.

You can get caught up in the logic where you have tied a really good system, namely the weather, to a system no one wants a $50 million overly-subsidized business and because you have joint efficiencies, package those and market them together.

In summary, I would say that in the land sensing side I would recommend an increased focus on the Government responsibility for establishing the value of the data rather than an increased emphasis on the sale of the hardware.

On the weather side, I would suggest that it is not anywhere near a decent candidate for commercialization, and that the logic which would tie it to the Landsat as a package has to based on the premise that you have decided for some noneconomic reason to keep the civilian satellites in the air.

That completes my comments. I would be happy, obviously, to answer any questions.

[The prepared statement of Mr. Bennett follows:]

STATEMENT OF

GEORGE BRAXTON BENNETT, CHAIRMAN
BRAXTON ASSOCIATES, INC.
BOSTON, MASSACHUSETTS

before the

SUBCOMMITTEES ON

NATURAL RESOURCES, AGRICULTURE RESEARCH
and
ENVIRONMENT AND SPACE SCIENCE AND APPLICATIONS

of the

COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

July 14, 1983

For three months last summer and intermittently since then, I have worked as an unpaid volunteer with a group called the President's Private Sector Survey on Cost Control (PPSSCC). Although I am not a member of the Executive Committee of this presidential task force, and therefore, cannot officially speak on their behalf, I did serve as a project manager for them, leading a team of volunteers who reviewed the activities of the Department of Commerce. In this capacity, I helped generate suggestions regarding cost reduction/revenue enhancement opportunities within the Department of Commerce which were then processed by the President's Private Sector Survey Executive Committee and submitted as recommendations to the President.

The report which was submitted to the President is now public, and among other things, contains suggestions regarding the commercialization of U.S. civil satellites. I have brought copies of the pages from this report which relate to the commercialization issue with me for those who are interested. My testimony today will, for the most part, be consistent with that material, but since I cannot officially represent the President's Private Sector Survey, for the record my comments should be viewed as those of an informed, impartial citizen and businessman.

My suggestions regarding the commercialization issue can be summarized as follows:

CIVIL LAND REMOTE SENSING SATELLITES (LANDSAT)

Instead of focusing on the transfer of physical assets, the Government should focus on creating an environment which permits private sector firms to assess the commercial viability of launching and operating their own civil land remote sensing satellites. To facilitate the assessment process:

- Steps should be taken to eliminate Government involvement in any phase of land remote sensing beyond the collection and storage of raw, unprocessed data, and
- A mechanism should be established to assess the true commercial value of raw civil land satellite data.

If the true commercial value of civil land remote sensing data is not high enough to attract private sector participants, the Government should assess the importance of the civil land sensing program to the goal of the U.S. to remain the world leader in remote land sensing. If the R&D activities and operational experience of defense-related land sensing can keep the U.S. in the forefront of technology, sticking to the current plan of not launching any Government financed civil land sensing satellites beyond LANDSAT-D' seems appropriate.

WEATHER SATELLITES (METSAT)

The commercialization of the weather satellites, either alone or as part of a package which includes both land sensing and weather satellites, except under very special circumstances, should probably not be pursued.

I will now elaborate on why I think these suggestions are sound.

CIVIL LAND REMOTE SENSING SATELLITES

Commercialization of the Processing from the Raw Data Forward

The research conducted by the Land Remote Sensing Advisory Committee (LRSSAC) which was appointed by Secretary Baldrige in April, 1982, indicates that there is strong private sector support (and that there are no major barriers) for the immediate commercialization of all activities beyond the collection and storage of raw, unprocessed data. Taking steps which eliminate Government involvement in these downstream activities seems logical and would be welcomed by numerous firms interested in increasing their participation in the data conversion and distribution processes. Specifically, the private sector firms think that the Government should cease to be involved in converting raw data into images (in the form of computer compatible tape or film) and in processing and distributing image data.

Commercial Value of Raw Data

Although the Government has expressed an interest in selling the entire LANDSAT system, no private sector firm has expressed interest in buying the whole system on a stand-alone basis and running it as a commercial venture. According to the LRSSAC report, the reason the private sector has shown little interest in purchasing the LANDSAT system is that there is enormous uncertainty as to the economic value of the raw data it produces. Current prices are much more a reflection of operating costs than they are of the value of the data to the users (value-in-use).

This cost-based rather than value-based pricing suggests that in order for private sector firms to assess the commercial viability of civil land remote sensing, a mechanism must be established to determine the true value of the raw data.

The establishment of such a mechanism would represent a shift in philosophy regarding the transfer of civil remote sensing capability to the private sector. Rather than literally selling the LANDSAT hardware (which will probably all be scrap by 1988 anyway), the emphasis would shift to demonstrating the value of the data, and through this process encourage the private sector to launch private sector satellites and build private sector ground stations.

William Spann of Metric, Inc. of Atlanta, Georgia estimates that Government revenues in FY 1982 from the sale of LANDSAT data were $12 to $15 million. He also estimates that the revenues of private sector firms which add value to the data and sell it to end users were $25 to $30 million in FY 1982. This puts the total revenues in the range of $37 million to $45 million, which importantly bears absolutely no relation to the value of the data to the end users.

There are several stories in circulation which suggest that the true value-in-use of satellite sensed land data for oil and mineral exploration is quite high. One such story describes how a firm scanned one thermatic mapper map (covering 100 square miles) and found a $100 million coal seam. Assuming this tale is true, how much would this firm pay for ten more maps of high potential areas? If they can get the maps virtually free, who would they tell how much they would be willing to pay?

Given that it would only take a few hundred million dollars in revenues per year to entice one or more private sector firms to launch and operate land sensing satellite systems, "smoking out" the high value-in-use users, if any, would drive the commercialization process. There are obviously several methods for trying to establish the true value of the data, but one which seems to have a lot of merit is described below:

- The Government should sell at six-month intervals through an RFP bidding process, the "right" to price the raw data which are transmitted from LANDSAT-D and LANDSAT-D'. The winner of the bid, the "LANDSAT pricer," should then have complete control of the prices for the raw data for six months and should get 70 percent of the revenue; the other 30 percent should go to NOAA. Anyone, anywhere, in any country should be free to buy the raw data at the established prices.

- This process would "smoke out" bidders from industries where the value-in-use of the data is high. If a firm knows the value of the data to its competitors is high, the appeal of 70 percent of the revenue would provide incentive to become the "LANDSAT pricer" and raise prices. Falling demand at high prices (including zero demand at prices above value-in-use) would keep prices from increasing beyond their value-in-use for key applications.

- The "LANDSAT pricer" would, like anyone else, be permitted to purchase raw LANDSAT data at the established price and would be free to compete with those firms which process and resell the data. In the case of the "LANDSAT pricer," however, the 70/30 percent split would not apply. The entire purchase price would go to the Government.

- Reselling the rights at six-month intervals would give firms a chance to assess and reassess the value of the data to them and to their competitors, their vulnerability to high prices, and the potential value of 70 percent of the revenues.

- It is not inconceivable that prices for particular kinds of data (like those used for oil exploration) would escalate dramatically in a very few months and that tens if not hundreds of millions of dollars in revenue would flow to the "LANDSAT pricer" and to the Government.

Unfortunately, the "LANDSAT pricer" mechanism might put the price of the raw data out of the reach of several end-use applications. This disadvantage would, however, be offset by the fact that the large revenues from high value-in-use applications would create the incentive for private sector firms to launch remote sensing satellites and eliminate the need for a government civil system.

Satellites Beyond LANDSAT-D'

It is important to emphasize that the "LANDSAT pricer" concept might end up demonstrating that the value of the data is not substantial. If this is the case, Government subsidies beyond LANDSAT-D' should be seriously questioned.

According to Gordon Law of the Office of Technology Assessment, over the last eleven years the U.S. Government has invested approximately $2 billion in civil land remote sensing. Included in this $2 billion are the $504 million in capital costs incurred for the currently active satellite, LANDSAT-D, and its as-yet-unlaunched successor, LANDSAT-D'. Current estimates suggest that the two successors to these satellites, if funded, would require an additional $476 million.

These investments of taxpayer dollars are quite large when contrasted with the current size of the civil land sensing industry ($37 to $45 million). I would argue that if the true value to the processors/users of the data is not substantially greater than the amount they paid in FY 1982, the President and the Congress should carefully assess the importance of civil land remote sensing activities to overall U.S. leadership in land sensing technology, and then weigh this against the high cost of further civil sensing subsidies.

The issue of foreign competition should resolve itself. If the "LANDSAT pricer" concept demonstrates that civil land sensing is a $50 million industry for the foreseeable future, worrying about the U.S. market share of this virtually nonexistent market should probably not be among our highest national priorities. On the other hand, if the "LANDSAT pricer" concept demonstrates that civil land sensing data has high value, the U.S. firms which have participated in the eleven years of publicly funded research should be able to be world class competitors in the land sensing industry which evolves.

WEATHER SATELLITES

The arguments which suggest that the weather satellites should not be commercialized range from the fact that the Government is virtually the only customer to the complexities associated with long-standing international agreements. I will not repeat all of the arguments, most of which have been communicated to this group, but I will add my vote to those who suggest that the problems associated with such a transfer appear to far outweigh the benefits.

One argument for commercializing the weather satellites is based on the logic that the total cost of operating the METSAT and the LANDSAT satellites as a system would be less than the total cost of operating them separately. This logic makes the implicit assumption that the United States has decided to continue to subsidize the civil land remote sensing activities. If this is the case and the other arguments related to the commercialization of weather satellites can be overcome, analyzing the cost savings which might be achieved by running METSAT and LANDSAT as an integrated system would have some merit. However, if the United States has decided that it does not want to continue to subsidize the civil land remote sensing program, looking at the joint economics is not relevant. Obviously, completely eliminating a system which is not wanted or transferring it to the private sector (LANDSAT) will reduce costs more than incrementally improving its efficiency by linking it with a cost effective system which should survive (METSAT).

SUMMARY

Let me summarize by restating my main points:

CIVIL LAND REMOTE SENSING SATELLITES (LANDSAT)

Instead of focusing on the transfer of physical assets, the Government should focus on creating an environment which permits private sector firms to assess the commercial viability of launching and operating their own civil land remote sensing satellites. To facilitate the assessment process:

- Steps should be taken to eliminate Government involvement in any phase of land remote sensing beyond the collection and storage of raw, unprocessed data, and
- A mechanism should be established to assess the true commercial value of raw civil land satellite data.

If the true commercial value of civil land remote sensing data is not high enough to attract private sector participants, the Government should assess the importance of the civil land sensing program to the goal of the U.S. to remain the world leader in remote land sensing. If the R&D activities and operational experience of defense-related land sensing can keep the U.S. in the forefront of technology, sticking to the current plan of not launching any Government financed civil land sensing satellites beyond LANDSAT-D' seems appropriate.

WEATHER SATELLITES (METSAT)

The commercialization of the weather satellites, either alone or as part of a package which includes both land sensing and weather satellites, except under very special circumstances, should probably not be pursued.

Mr. SCHEUER. Congressman Brown of California.

Mr. BROWN. First, may I inquire if you could provide to the committee the copies of the pages from the report that you referred to? I would be interested in looking at them.

Mr. BENNETT. Fine. OK.

[Pertinent excerpts of the "Grace Commission" report are printed in the appendix:]

Mr. BROWN. Second, you have an interesting suggestion for determining the true value of the Landsat data. But it occurs to me that there might be alternatives which would be equally workable and would not be totally inconsistent with your proposal.

I like the suggestion that we get the Government out of the processing of the data. But there still could be a role for the Government as sort of a utility function of providing the data at a cost which recoups their out-of-pocket operating expenses, perhaps not the capital investment, and then leaves to the private market the question of how to utilize that data best.

In other words, everybody could have the data at the same price, which would be similar to the present pricing system, and the Government could recoup whatever it saw fit to recoup through, for example, a levy on assets on public lands or resources on public lands. The resources would be determined from the Landsat imagery.

Mr. BENNETT. Yes, you could do that.

Mr. BROWN. That would make it possible for users at any level, those who could get a big advantage and those who could get a small advantage, both to use the data because the data would be relatively inexpensive. The Government would then recoup from some of these users but not necessarily from all of them.

Private owners of land on which there were unknown resources discovered in this way would have access to data also, and would be in a position to sell their resource rights to the highest bidder as they do now.

But the Government would benefit from the additional capability of developing presently unknown resources that would improve our overall productivity—I guess you might say as a Nation—as a result of using these resources.

Mr. BENNETT. Yes.

Mr. BROWN. I am not in a position to evaluate these alternatives, but I just suggest them for any comments you might like to offer.

Mr. BENNETT. I do have a few comments.

I think there is a fundamental question about the relative efficiency of having the Government play a substantial role over the next decade or two. Under the proposal that I have made, it is true that the prices would be driven up in the near term to the values of the highest value-in-use.

I argue that if, in fact, you could establish that there is a commercial market at the highest value-in-use such that private companies would put up satellites and set up stations to collect data because they recognize the value of the data, and the Government is not artificially giving that data away to that group, then segments of this market would emerge. In the same way, there are Mercedes and Reliants, there would be people who put up satellite systems that had not the same resolution, not the same capabili-

ties, who would satisfy some of those users that in fact cannot afford to pay and are not interested in the same degree of resolution or detail.

But to me it is important to establish for the private sector that there is at least one segment that is large enough and profitable enough to justify private sector investment. Unless this market is different than most others, it is not reasonable to assume that there is a satellite system that has sufficient bells, whistles, and scientific features to satisfy the data needs of all users.

In most other businesses, there is a tendency toward segmentation, and a tendency to target individual segment needs. The Landsat pricer is a way of motivating the private sector to evaluate the economies of serving each of the nooks and crannies of opportunity.

The other way is one where the Government, if it plays that role, will have the asset of those satellite pictures spread more bodily, but I think this Government participation will not attract private sector investment to go for the nooks and crannies.

Mr. BROWN. I am not really suggesting that the Government play any role other than what you suggested of providing raw data and leaving it up to the processor to determine what the marketability is.

Mr. BENNETT. I think there is important clarification here. My expectation would be that if the Landsat pricer idea were implemented, within 24 months, private sector firms would be sending up their own satellites to drive the Government out of business. I mean the intention would be that.

The intention would be to establish sufficient value that the Government would no longer have to put up satellites after Landsat-D'. If you sold the data and established the value of the data, within a 24-month period—assuming there is value—the private sector would launch satellites and the Government would no longer need to supply the raw data.

Mr. BROWN. That is a valuable idea. It provides a dynamic to the process that we do not have at the present time, but I still feel, just by virtue of the fact that it excludes low value-users of the data, it has some disadvantages.

The Government, you know, has a long history of providing data, research data, for example, that it has developed. We started doing this with agriculture research data and we do it with weather data. We do it with a wide range of data and we make it available to any user.

Then the value-added processors come in and make what use they can of this kind of data.

Mr. BENNETT. Yes; if we decide as a matter of public policy that spending another billion dollars of taxpayer money to supply that data is a worthwhile expenditure, that is not right or wrong. It is a policy decision that the data does support the public good.

If there is pressure, though, to commercialize land remote sensing, you are going to have the imperfections of free market forces which will have the effects you say.

I would like to not personally be in a position of arguing one side of that or the other. It goes to a policy question as to whether or not those large subsidies are worth enough public good to be justified. But if we are going to commercialize, I argue that the meth-

ods I have outlined are a method to fairly expeditiously get on with it, but I concede it would have the effects you have described.

Mr. BROWN. Both—or any scheme—depend upon there really being a public value which justifies the capital investment on the part of the Government to provide the data.

Mr. BENNETT. Yes.

Mr. BROWN. We would not do it for agriculture research, as we started doing a hundred and some odd years ago, unless we knew that it would benefit the public through the enhancement of the productivity of agriculture, for example.

Mr. BENNETT. Sure. Yes.

Mr. BROWN. Let me ask you one other thing.

In your consideration of this problem, did you look at the situation as it would be affected by the development of new technology such as the civilian use of the military level of technology, or the development of new sensors not now in use, which would provide additional data streams that might be of greater commercial value?

Mr. BENNETT. Yes; it would be my expectation that the boundary we have been able to draw historically between the military and the civilian, is not over the long run under our control.

The French certainly have, you know, an independent stripe to them that might say that if they want to do higher resolution work for nonmilitary applications and sell it, that, subject to international agreements, that they will be able to do that.

I would suspect that there will be more cost-effective technology, and that there will be technologies related to specific end-use applications that will emerge. The more this thing is a part of the private sector, the more likely the different segments that emerge will get serviced with technology that is cost effective.

Mr. BROWN. This is strictly a policy, not a technological question because we dropped the resolution limits from 80 to 30 meters just 2 or 3 years ago.

Mr. BENNETT. Yes.

Mr. BROWN. The French have gone to 20 or 10 meters.

Mr. BENNETT. Ten. Yes, that is right.

Mr. BROWN. So that is a policy issue. It is not a technological issue.

Mr. BENNETT. Yes, that is right.

But over time what I argue is that data which we wish some of our trading partners or other countries did not have, will be available from others. It will not be a matter of what Congress or the President wants to be widely circulated.

Commercial enterprises that have access to some of those military higher technology units, turned loose to compete in the world market, could probably compete very, very effectively with their foreign counterparts given that we have subsidized this technology as we did agriculture over the last 10 years. We have spent lots of money and probably have a lead based on it if we choose to use it.

Mr. BROWN. Thank you. I appreciate your final point.

Mr. BENNETT. Thank you.

Mr. SCHEUER. Congressman McGrath.

Mr. MCGRATH. Thank you, Mr. Chairman.

Mr. Bennett, I found your testimony most refreshing. It is somewhat in line with my own thoughts.

Let me see if I am straight on what you said. One is, that unless some circumstance be identified, where the satellites should not be placed in this RFP.

Two, research and development should still continue at the Federal level for new kinds of land-sensing opportunities.

The third would be that the raw material that is presently being generated by all kinds of the Landsat satellites, be continued in the same manner only we price the value-added data. You suggest a 70–30——

Mr. BENNETT. Excuse me. Price the raw data.

Mr. MCGRATH. OK. Price the raw data.

Mr. BENNETT. Price the raw data where 70 percent would go the pricer and 30 percent to the Government.

The pricer would bid based on what he thought he would get. If he thought the data were worth a half a billion, and 70 percent would be worth $350 million, he might bid $300 million to the Government. So the Government would not only get its 30 percent, it would get whatever the fellow would bid in order to make a reasonable return on his investment.

The only money the external bidder would make would be the money for the risk he took relative to the uncertainty of the value of the data.

Mr. MCGRATH. Realizing that most of the land sensing satellites would go out of business, as you said, by 1988, and say that we can come to some agreement as to whether or not we are going to go ahead with this, do you have any suggestions on how we would be able to either do it or not, integrate the existing fleet with new technology and new birds that might be flown by some private entrepreneur?

Mr. BENNETT. I am not sure that I understand the question.

Mr. MCGRATH. Let's say that we have a few birds up there by the time we get ready to go into this operation. Do we leave those separate and have the Federal Government continue in a role that would be somewhat competitive with an entrepreneur?

Mr. BENNETT. Yes. Until those are out of business, until the Landsat-D′ is scrapped in 1988 or before, I would let it run in parallel.

The natural forces will force the bidder on the Landsat pricer to bid the price down to the point where he is competitive with whatever private sector satellites are put up. There is no reason why the satellite during that period would not play in the market.

The other thing that is important about these satellites from the research we have done, is that they are not all vanilla. That is, that the French SPOT system has stereoscopic effects, and you can see mountains. Ours has a wider bandwidth where you can see infrared that you cannot see with the French.

The individual private companies that send up satellites would be foolish to put up a satellite that is a direct analog of Landsat-D′. They will look for a niche. They will try to get in a segment that you have demonstrated as high value-in-use, but for which Landsat-D′ is probably overengineered. Then they will put up a satellite much more cost effective to capitalize on the niche.

What I propose is a simple scheme. I envision a simple price sheet, so the Landsat pricer does not play around with all the nuances of marketing.

The raw data is marketed in a very uncomplicated way and there is a simple price list. At 6-month intervals you sell the rights to put the numbers in that price list. It is not complicated. Somebody pays you a couple hundred million bucks, and for 6 months he writes the numbers in, and whatever money flows in, he takes 70 percent of it.

It is a simple, straightforward process. If Congress moved rapidly, it could be implemented in a matter of days or weeks. Then it would be updated at 6-month intervals. The reason I would do it at 6-month intervals would be that I would want people to assess what their competitors are doing, what the data is really worth to them, what their vulnerability is if the guy down the street decides to buy it and raise the price because he knows it is worth something.

I would do it at fairly frequent intervals, keep it very simple, and I would keep it directly in parallel with the private sector until Landsat-D' fell out of the sky. Then I would get the Government out of business, and assume the private sector, having had the value established, would stay in.

This assumes that we have decided as an economy that we would like to be out of the business. Now if there are noneconomic reasons that we want to invest in remote land data, that puts the debate on a different plane.

Mr. McGRATH. In some cases, it would. I mean there are agencies, there are universities, there are others using this data at the present time that paid little or nothing for it.

Mr. BENNETT. That is right; yes.

Mr. McGRATH. This complicates the issue substantially.

Mr. BENNETT. Yes.

Mr. McGRATH. I have no further questions, Mr. Chairman.

Mr. SCHEUER. Congressman Volkmer, the cochairman of these hearings.

Mr. VOLKMER. Yes, thank you.

Mr. Bennett, I am a little intrigued by your pricing mechanism, et cetera. One thing that concerns me a little about the whole basis for your discussion and the way we could operate Landsat system by using raw data, is that as everybody knows Landsat-D' by 1987 or 1988 is out of business and there is nothing else going up. Now you say that private enterprise would go in and do this.

My question to you really is that if we do it on a 6-month basis on the pricing on the raw data, and I only have it for 6 months and I know 6 months from now somebody else may get it, why should I put up a satellite?

Mr. BENNETT. If in the——

Mr. VOLKMER. In the meantime until we do it, in other words.

Mr. BENNETT. Why should you put another satellite? "You" being the Government?

Mr. VOLKMER. No. I am the private corporation.

Mr. BENNETT. Oh. The private sector——

Mr. VOLKMER. I have the first 6 months. I want it. I am pricing it.

Mr. BENNETT. If you are pricing it now——

Mr. VOLKMER. Right.

Mr. BENNETT [continuing]. Then if you in fact price it high because you know that three competitors are—like you—using it, it has very high value, and you have decided to take 70 percent of what it is they are going to have to pay, then they have to worry that you will even bid the price up and get it again the next time for the next 6 months. I mean they have to be forever trading off whether the ratchet is finished yet.

There is a lot of discipline on this process related to what they guess and when they bet. What I an arguing is that if those prices went up to the true value in use, that some third party sitting on the sidelines says, my goodness, the Government has got that thing where it is selling it a rate of $400 million a year. I can put a satellite up there for $160 million and take the best two-thirds of that market.

Then the guy will shoot the satellite up. So, it is the very process of bidding the price up which creates incentive for people to say, I can do better than that. I will give you a price better than the price of the Government through its Landsat pricer.

What you want to have happen is to have those prices escalate sufficiently so that the private sector is enticed to put up satellites to provide it at a cheaper cost.

Mr. VOLKMER. That is assuming that the price is out there and that there is demand for it.

Mr. BENNETT. Yes.

Mr. VOLKMER. That is an unknown at this time. We are talking about around $35 or $45 million at the present time.

Mr. BENNETT. That is right.

Mr. VOLKMER. Now let's assume that in that first 6 months I went ahead and I bid $200 million, and I got it. But lo and behold when I sold it out, I only sold $50 million out.

Mr. BENNETT. Yes.

Mr. VOLKMER. Now I've gone in the hole, haven't I?

Mr. BENNETT. You have made a bad business decision. [General laughter.]

Mr. VOLKMER. What's the next one going to do?

Mr. BENNETT. Then he would bid low. Then we would have established that right now we have spent $2 billion to subsidize a $50 million industry. That is OK, if we decide there are other elements of public good to justify it.

Otherwise, we have to rethink whether we should continue subsidizing a $50 million industry. The next two satellites are going to cost us about another half billion, and I think we should ask why it is that that group, although vocal and well intentioned, should get the taxpayers' half billion dollars to subsidize their $50 million industry. One reason we can do that is that we think the data might find other uses later which are not currently known. Or, we might say that having that data is like having weather data. We just think the world should have lots of data to wallow in, and we will pay that price.

Mr. VOLKMER. Right. I'm not disagreeing with your whole concept. In fact, I kind of like it. I pretty well agree with it.

Except, it comes down to, for those people at universities, et cetera, that may wish to use the data just for purely research purposes, all right——

Mr. BENNETT. Yes.

Mr. VOLKMER [continuing]. Your system, if the pricing goes up pretty well puts them out of using that anymore.

Mr. BENNETT. I would argue that if you establish that there is real value for the data, that that would create profits for people who make satellites. The technologies from economies of scale of making more satellites, and from the visibility and interest, and the cost of satellites combined with things like the space shuttle, would come to the point where there would be people who would be able to put up satellites that could get into those research areas at reasonable cost.

In my view, we should not think of it as a satellite, and a technology, with all the bells and all the whistles for all users. Instead, we should ask: What does the university community need? What kind of research are they doing? How much could they pay? With the second perspective, I think that the technology of satellites, the delivery systems to get them in the air, and the economic incentive to serve the different niches will encourage firms to deliver data at prices which researchers or their sponsors can afford.

Mr. VOLKMER. Let me ask you this. Would not the person who has the satellite up also have to do his ground work? He has to have his hardware to receive the information.

Mr. BENNETT. To me, once the Government has established that, the data has value, it can let the invisible hand decide that.

The fellow that puts up the satellite could do his own ground work and his own marketing and distribution, or he could sell those rights.

But what the Government has done, as I said earlier in my testimony, is focus on the physical sale of hardware. I think the Government should, instead, focus on mechanism which allow people to know what the data is worth, and then let the "invisible hand" decide how the data is collected and disseminated. But we as a government, by giving it away, have denied the invisible hand the right to figure out who ought to be supplying it, and what it ought to cost, and whether or not it is worth putting them up there. Allowing the invisible hand to work would, I think, be a real contribution toward the whole commercialization process.

Mr. VOLKMER. Thank you, Mr. Chairman.

Mr. SCHEUER. I think we have all found your testimony thoroughly intriguing and challenging, Mr. Bennett. I think maybe intriguing is a better word.

Mr. BENNETT. Thank you.

Mr. SCHEUER. Mr. Bennett, that $400 million figure is especially intriguing. We wonder—where did that come from? It seems like a lot of Uncle Sam's calling cards. Can you tell us something about where that figure comes from?

Mr. BENNETT. Sure.

Mr. SCHEUER. What are the assumptions under which you produced that figure? Do others in the land sensing community share your view as to the potential income there?

Mr. BENNETT. William Spann, who has done a lot of market research in this area, and who testified in front of this committee a week or so ago, is a fairly optimistic forecaster.

I think it might be worth while, too, to recheck some of his past forecasts, and how well he has done.

My recollection is that his record for forecasting 2 and 3 years ahead is within 5 or 10 percent. It is a very good record. He is forecasting some pretty big numbers going forward.

The thing that we did to test the $400 million was to look at the magnitude of the exploration expenditures of the major U.S. oil and mineral companies in the world. So we looked and said, how much money do they spend on exploration and on related activities. That includes mineral and other products. What would it take as a percent of their expenditures, or a percent of the kinds of revenues they have in a year, to get $400 million? It is not very much. When a big oil company has $60 or $90 billion in revenues, paying $300 or $400 million for data if the data is really valuable is not out of the question.

The other thing we checked was how many people they currently have pouring over Landsat data. We found one instance where a company spokesman said, there were several dozen people, full time, analyzing Landsat data in his firm. Now that says somebody is doing something with that data, and that it is useful to them.

The number of $400 million is not a number that was built up in small pieces and then added. We said, if we took one-tenth of 1 percent of the revenues of the oil companies, can you get a number that would cause people to put up satellites? And you can, with ease.

So $400 million is not a number that would strangle the coal companies, or the oil companies, or the copper companies, or the people who might in some way use the data.

For purposes of the original report, the PPSS report, we took a number which we intended to be conservative. We just took a number that was large enough to be impressive and catch people's attention, but under close scrutiny was not at all ludicrous, if the data has value to the people.

Now I want to be careful. I do not want to get put in a position of saying that the raw data has a value of $400 million. I am saying it is a very valuable public function to figure it out. If they don't want it, and won't pay for it, then we really are subsidizing a $50 million industry with a lot of money.

Mr. SCHEUER. Then what you are saying is that we ought to find some kind of a market mechanism that will tell us whether it has value or not, and how much we are spending for the public good?

Mr. BENNETT. That's right.

Mr. SCHEUER. Then we can make our own value judgment as to whether it is worth it?

Mr. BENNETT. I like that articulation.

The suggestions I have made do not preclude any of the other suggestions you have on the table for commercialization. If you had that data you would know how much, as you just stated, how much you were investing in the public good.

You could decide then, at that point, whether or not you would let natural commercialization forces take place, or you wanted to continue to subsidize the industry.

The important thing is, that the time fuse is short. We have a satellite that is not working super well now, Landsat-D' we have Landsat-D' that will last 3 or 4 years. The interesting thing is you could implement the idea I have suggested in 3 weeks. Maybe I should not be so presumptious within the Government environment. I work in the private sector. [General laughter.]

Mr. BENNETT. The concept is fairly straightforward. It is a paper idea. It involves selecting firms to fill out a price list.

Mr. VOLKMER. How about a year?

Mr. BENNETT. A year. OK.

It could be done very expeditiously if we decided there was value in doing it expeditiously.

Mr. SCHEUER. Congressman Bateman of Virginia.

Mr. BATEMAN. Thank you, Mr. Chairman.

Mr. Bennett, I was particularly intrigued with your observations with reference to the commercialization potential of the meteorological satellites.

Your testimony seems to put you on the side of doubting much more significantly the feasibility of that, as opposed to the land sensing satellites.

Yet, there has been some discussion before the committee that land sensing satellites are not practical for commercialization because no market has yet developed for them.

I wonder if you could elaborate a little on why you feel that there is less promise for commercialization, or less practicality for commercialization of the meteorological satellites?

Mr. BENNETT. OK. Let me make sure with regard to Landsat though that I clarify my comments.

There is now only $30 to $50 million of revenue. But it is possible that those same users would pay $2 billion. When we say there is no market, we in the Government have given away the data and have not permitted the natural forces to tell us what that data is worth. The $30 to $50 million, as far as I can tell, has absolutely no relation to the value of land remote sensing data. It is unrelated. It is a fabrication related to operating costs, and only a fraction of those. So it is not meaningful.

In our PPSS work, we focused primarily on the land sensing question. On the weather side, there are a lot of complications, as I sited, ranging from international agreements to the argument that collecting and disseminating weather data is principally a governmental function. Those arguments are compounded by others.

Arguments suggesting that the weather satellites should be commercialized, to the best of my knowledge, did not surface until the Government realized that there is little interest on the part of private sector firms in purchasing and running Landsat as a standalone system—given the uncertainty in the value of the data.

I guess my testimony should be more in the direction of saying that I see no compelling reason to commercialize the weather satellites. It seems like a largely governmental function to me. Weather satellites were not the basis of a lot of PPSS analysis as the Landsat work was. But my intuition puts me on the side of those who do

not want to get it twisted up with Landsat. I'd like to make a hard decision on Landsat. The weather satellite is a separate issue. My personal opinion is that it is not a candidate, or should not be considered as a candidate for commercialization.

Mr. BATEMAN. There are a number of things that I think in your testimony today that intrigue me, and it has been indicated, other of my colleagues.

One of the things that I find somewhat intriguing is that I have not heard you coming down on either side of the significant public policy considerations that enter into this. You are taking as a given, in your testimony, that there is a thrust toward commercialization of either or both satellite systems, but you are not recommending that necessarily as a public policy position.

Mr. BENNETT. That is right.

Mr. BATEMAN. Let me explore that with you for a moment.

Some century, I suppose, or more ago, we have had a National Weather Service in one administrative department or another. We have had our Naval Observatory. We have had the Coast and Geodetic Survey. All of these gather data and have disseminated it for relatively little cost.

Apparently, we have made a judgment even in a former era that this had a social value, even in the heyday of laissez-faire, that it had a social value and was appropriate for the Government to do.

Are there some forces that you can identify which have changed, or ought to induce the rethinking of that?

Mr. BENNETT. It is my understanding that the forces are driving toward commercialization have been set in motion by both a Democratic and a Republican administration, and have to do with the large expenditures and the nebulousness of the public good that is being derived.

I saw a statistic the other day that said our Federal deficit today is larger than our Federal budget was in 1971. In that environment, it is not surprising that half a billion dollar expenditures for public goods that are of nebulous value, come under close scrutiny.

That does not say that putting them under close scrutiny and getting rid of them is right, but it explains why the subject of commercialization has surfaced.

If we cannot see who is benefiting and why they are benefiting, then we should give the expenditure close scrutiny.

As part of the PPSS effort, I was asked to identify and work on key issues. The commercialization issue was presented to me as if the OMB, the Counsel on Commerce and Trade, and other public bodies, including many Members of Congress, were of the opinion that the Landsat system should be commercialized. We devoted our energies to developing ideas to carry out the commercialization in the most cost-effective way?

That is the reason I like to try to straddle the policy question. I think that the comment that was made earlier is highly relevant. The set of ideas that I have presented gives us a way of quantifying the magnitude of the subsidy. Now let's compare that with "the public good," and decide if the subsidy is justified.

Mr. NELSON. Would the gentleman from Virginia yield?

Mr. BATEMAN. Surely.

Mr. NELSON. I think for us to get to that point, as the witness Mr. Bennett has said, we must remember the first question that he suggests that we ask.

That is, shall we assume that the Defense Department is concurrently through R&D producing land sensing satellites for their purposes, which keeps alive this technology. I would suggest to the chairman of this committee that we have a closed session and determine that answer.

Then second, if the answer to that is yes, then I think that we should ask the question and come to a conclusion, is what the Defense Department is doing, in a narrow range, sufficient to keep alive the technology that might be developed by having a wider range on a Landsat such as D' and its successors?

Let's make a determination, if there is value to this country, that we should develop these others that may not be done if it were put into the commercial end.

Mr. BENNETT. Yes.

Mr. SCHEUER. Will my colleague yield?

Mr. NELSON. Certainly.

Mr. SCHEUER. He hit on a very important point, and I don't want to take up the time from my other colleagues. You hit on a very key point, and we do plan to have a closed hearing on this very matter as soon as possible, probably right after recessing, perhaps before.

We will move ahead with the discussion.

Mr. NELSON. Be mindful when we have that, if the gentleman will still continue to yield, be mindful not only to look at the question, yes, the Defense Department is developing the technology that they need, but that there is a wider application of that technology beyond the Defense Department that might be in the interest of this Nation that we continue, that might not be developed in the commercial sector were we to turn this over.

Mr. BENNETT. Yes.

Mr. NELSON. I thank the gentleman for yielding.

Mr. MCGRATH. Would the gentleman yield?

Mr. BATEMAN. I would be happy to.

I don't know how much time I've got, but I'm very generous with it.

[General laughter.]

Mr. MCGRATH. Maybe I am misrepresenting the testimony of our witness, but I believe I heard him say that he believed that the technology would be advanced by the private sector in some cases, perhaps in all cases, by the fact that if it is a viable business, that the industry would develop those needs that they seem to have. Am I correct?

Mr. BENNETT. That is correct.

There are always instances where we have to raise the question as to whether or not there might be some basic Government research that might yield ideas or potential, or lower costs that might open up commercial segments.

The issue would be: Is the Government going to sponsor basic research? Have we, by putting the billion in over 11 years, sponsored the basic research? Satellites fly, they work, and they can do many things.

The commercial sector is one of the better tentacles we can use to get the Government sponsored research into the niches of usage that it should find. The only question is: Is there any other basic research that is more naturally a Government task? I am sure we could find people on both sides of that debate.

Mr. McGRATH. I thank my colleague.

Mr. BATEMAN. Mr. Chairman, if I have just a moment longer, let me——

Mr. SCHEUER. The gentleman's time is just about expired.

[General laughter.]

Mr. SCHEUER. We have not been running by the clock, so we are running way over time. So take one brief question.

[General laughter.]

Mr. BATEMAN. Mr. Chairman, I do not have so much a question, but I want to say that I applaud the notion that we are going to hear from the Department of Defense.

Mr. SCHEUER. We certainly are.

Mr. BATEMAN. I do not think we can resolve these issues. They are part and parcel and interrelated. We must know what we are doing there.

Mr. SCHEUER. I totally agree with the gentleman.

Mr. BATEMAN. With that, I will suspend, Mr. Chairman.

Mr. SCHEUER. Congressman Mike Andrews of the State of Texas.

Mr. ANDREWS. I just want to say that I did not hear all your testimony. I apologize for being late. But I have read your statement today, and I have found it most informative. I think all of us have. It is very imaginative, which is exactly what we are interested in.

One minor question, and then I would like you to comment on a more general question. You suggest in your statement a 30-percent royalty to the Government on data sales. How did you come up with 30 percent? Would you just expand on that a little bit?

Mr. BENNETT. That process was not highly scientific. It seems to me that the magnitude of that number is not highly critical.

If in fact you gave the Government 50 percent, and let's say the private sector executive decides that he could sell the data for a half a billion, then the Government gets half of that or $250 million, and he will get $250 million, so then he would bid $200 million. He would pay the Government $200 million then, thinking that his half would be worth $250 million.

If the split is 70–30, then if he thought he was going to get $350 million, he would bid $300 million. So the Government is going to get all but the risk-taking part that the private sector person demands.

The reason for the 70–30 split was to make it sound generous to the private sector. I don't think it matters whether it's 50–50 or 70–30. As a matter of fact, the 70–30 is less risky for the Government because it drives the private sector executive into the risk-taking. If he thinks he is going to get a half a billion, and he is going to get 70 percent, then he assumes that he is going to get $350 million. The Government will get $300 million in its pocket without any question, right now, today. The Landsat pricer is the one that has to go to bed at night worrying about whether he is going to sell it for the half billion that he estimated.

In my view, the 30 percent is not a highly sensitive number. By making it 70–30, you put more of the risk on the private sector people than you do on the Government.

Mr. ANDREWS. Second, one of the issues, of course, that we discussed over and over again among our committee members and from witnesses, has to do with natural monopolies and the consequences that may be incurred. I anticipate some of the testimony later today will deal with that.

I wonder if you would comment, just in general, your feelings and thoughts about the potential for monopolies?

Mr. BENNETT. OK.

My view would be that in the initial implementation of the concepts as I have outlined them, that from the raw data forward, the Government should insist that once the price is set, that any purchaser anywhere in the world, any corporation or individual, can buy at that price. So there would be no monopoly advantages from the raw data forward.

From the data back, there would be no monopoly because the only right of the Landsat pricer would be to price the data. Now what I suggest we do, which is a slight complication, is to say that the pricer himself can buy the data, but he has to pay the full price. In the instance when he purchases, he pays the full price to the Government.

That puts some discipline on the pricer if he is also a user of the data, to make sure that he does not set the price way above its value and use.

I would say under the concept that I have described and documented, there is no potential for much monopoly activity.

The question then is, if in fact we establish that there are markets for this data, might there be some concentration of those who can afford to put up satellites. I think that given the capital resources necessary, that there are likely to be a few people that put up satellites. But I think like other markets, there will be a natural tendency for segments to emerge, and for specialized satellites, with special purposes to be put into orbit to serve special constituencies.

If that specialized satellite, for a specialized constituency, ends up adopting monopolistic practices, he will have a competitor who will come in under the umbrella he has established, and the invisible hand will work in the direction that it should.

Mr. ANDREWS. Right.

I think the market place will pretty much take care of that.

Mr. BENNETT. My argument would be if you implemented the suggestions I have made, that the potential for misuse by monopoly powers is minimal.

Mr. ANDREWS. Thank you.

Mr. SCHEUER. Congresswoman Claudine Schneider.

Mrs. SCHNEIDER. Let me just begin by adding to the accolades that you have already received here today, and point out that the testimony that I have heard, without any exception, has probably been some of the most stimulating, creative, and thought-provoking that I have listened to in many, many a month sitting here.

Mr. BENNETT. Thank you very much.

Mrs. SCHNEIDER. I would like to question you a little further as to those different entities that use the services, but perhaps might not fit into that megacategory as coal companies, oil companies, and other wealthy recipients.

Mr. BENNETT. Yes.

Mrs. SCHNEIDER. What about the universities? What about the Third World nations? What about other users of those services? How do we address the transfer of service without the high cost that might otherwise be transferred?

Mr. BENNETT. My bet would be, and this is a thing which could be verified by technical experts, my bet would be that the megausers that you have referred to have needs that are substantially in excess of the Third World needs, or some other researchers. And that they would pay an enormous premium for higher and higher resolution, that they would pay an enormous premium for some of the stereoscopic effects, or some of the multiple band widths.

There are some Third World countries that want to just look over what their crops are doing for agricultural purposes, that cannot develop the economy they've got, given their education levels, let alone, you know, have other industries founded on things you might discover with the satellites.

I would assume that there would be needs for Third World countries, and even needs for universities, where they could be doing research in specialized applications, where in fact they would not need the same degree of resolution as the megaworkers.

The other thing that we could assume is that it might drive the oil companies and the coal companies into a position of sponsoring research at the universities. It just may mean that the Government may say, as a condition, to make sure that the concept works, that if the oil companies and the coal companies need people to be studying satellite output and doing creative research, that they could sponsor research at the university level.

Mrs. SCHNEIDER. You do not think that they would come to us and ask us for a tax credit to do that?

Mr. BENNETT. I am sure they would. [General laughter.]

Mrs. SCHNEIDER. I cannot help but see those dollar signs still fluttering before my eyes.

Mr. BENNETT. Yes.

But I think that there would be segmentation. All the testimony and publications that I have read, talk as if there is a single large satellite that has everything in it, that takes pictures, and then we sell them.

I think that unless this markets is unlike all other markets, be it automobiles or rugs, there is a premium sector, there is a middle sector, and there is vanilla. There will be product offerings so that each of those people's needs can be met.

I think the fact that the Government would have to think through it in a disciplined way to make sure the forces were put into play so that natural segments would emerge would be a requisite. But I think that the idea of segmentation would be the way I would address it.

Mrs. SCHNEIDER. It certainly seems to be on the right track.

What about some of the noneconomic criteria? Can we discuss that a little bit?

Mr. BENNETT. Noneconomic, meaning——

Mrs. SCHNEIDER. Meaning that, much of the discussion that we have had here this afternoon has focused on the economics involved in the transfer to the private sector of our satellite.

Mr. BENNETT. Do you mean the question in terms of noneconomic factors such as——

Mrs. SCHNEIDER. Beyond security, because we will get into the security ramifications of this kind of transfer.

What other kind of impact might the commercialization of satellites have? I guess that is a clearer way of putting it.

Mr. BENNETT. Impact in terms of benefits?

Mrs. SCHNEIDER. Yes.

Mr. BENNETT. Oh.

Mrs. SCHNEIDER. Or negatives.

Mr. BENNETT. My own personal bias would be that the impacts would be very much more positive than negative. Permitting people to use their creativity and ingenuity to come up with ways to serve specialized segments, would breathe life into the idea that I have been espousing, which is that putting commercial satellites into the private sector will not result in one big, overengineered satellite.

What it will do is cause segmentation to occur, it will cause specialization, and it will cause special kinds of arrangements with different kinds of user groups.

I think that one of the noneconomic benefits will be that the needs will be substantially better tailored to individual applications than they are with one system to serve all needs.

Mrs. SCHNEIDER. How about having some type of global continuity of information?

We are constantly being faced with the fact that we are no longer the United States, but rather we are moving into a world economy.

Whether we are discussing pollution, or whether we are discussing defense strategy, we are in a global environment.

The information obtained from these satellites, if it is entirely segmented, how do we achieve continuity of information when the time comes that we have to make global decisions?

Mr. BENNETT. There are two ways to address that. My bet would be that the globalization would occur within the specialty. That is, if there are those people who are going to monitor cereal crops, and have satellites that do that better than anyone in the world, the market for such services would be worldwide. They would not necessarily serve U.S. markets but worldwide markets.

Mrs. SCHNEIDER. So people who are interested in the cereal production, if they were interested in knowing about weather patterns, or the impact of El Niño not only on the United States, but on other countries, would then have to purchase that information?

Mr. BENNETT. From the U.S. competitor. We would insist, I would think, on continuing an open skies policy, encouraging the selling of the data anywhere in the world. At least we would not make explicit Government attempts to prohibit the sale of wheat data to Brazil and to Texas and to Canada.

I would think the individual subcategories would globalize, and that there would then be worldwide markets in those specialities. For example, the SPOT system has stereoscopic effects, so you literally can see mountain heights or tree heights. In fact, there will be applications where we should not be embarrassed or feel threatened to buy the data from the French, when that stereoscopic effect has advantage, unless it is a matter of national security, at which point it is not a commercial issue, but a defense issue.

But as long as they develop a series of commercial satellites and we let our private sector do the same, I do not think that our necessarily having a representative product in every segment of every potential usage of civil satellites is a prerequisite. You let the free market forces, as we do in automobiles, play. Hopefully with more success. [General laughter.]

Mrs. SCHNEIDER. Hopefully so.

Thank you very much.

Mr. BENNETT. Thank you.

Mr. SCHEUER. You have been a remarkably stimulating witness as you can deduce from the questions and the discussion here.

We thank you very, very much.

Mr. BENNETT. Thank you.

Mr. SCHEUER. My cochairman.

Mr. VOLKMER. I would like to carry a part further from my previous question.

That is, let's take the assumption that Landsat-D goes out within the next 6 months, and we put up Landsat five, and it only has about 3 years, and let's say it takes us 1 year from now to move this thing at Landsat from the raw data on out, is there sufficient time for it to work even under those circumstances?

Mr. BENNETT. I think there is probably a good chance that it would work. I think the chuckle we had about the rate of movement within a democratic body that requires a consensus building among hundreds of individuals is informative. The legislative process is much slower than the decisionmaking process an economic enterprise that is trying to make money for its shareholders.

I would claim that if you, over 1, or 2 or 3 of these 6-month periods, can establish that there is a half a billion dollar market for satellite data, you will see some 24 hour days from some big corporations. There will be continuity, and there will be a satellite in the air by 1988.

The private sector can move on a dime if it decides there is money to be made.

Mr. VOLKMER. In your opinion we do not need then to prepare another Landsat-D?

Mr. BENNETT. I am not a technical expert. I don't know if the Government were going to procure another one, how long it would take if we have not started it now.

Mr. VOLKMER. No, no; I am not going to that.

Let's assume that we could prepare another satellite.

Mr. BENNETT. Yes.

Mr. VOLKMER. So we would have not only prime, but we would have one to follow up.

Does that put in better shape to do anything?

Mr. BENNETT. I think that would be a safety valve, and without good technical testimony from those in the commercial sector who could say how fast they could get one in the air if there is a market, it would be hard for me to respond. I am not technically qualified to answer that.

Mr. VOLKMER. Thank you, Mr. Chairman.

Mr. SCHEUER. Thank you very much, Mr. Bennett. You have been a wonderful witness, and we have all appreciated it.

Mr. BENNETT. I have enjoyed it.

Thank you.

Mr. SCHEUER. We will now ask the panel to come forward—the chairmen of the ad hoc Government interagency panels on civil operational remote-sensing satellite commercialization.

Ms. Kathleen Charles, Deputy Comptroller, NASA Goddard Space Flight Center, chairman, business panel.

Maj. Gen. Earl G. Peck,, USAF, Director, Intelligence and Space Policy, chairman, technical panel.

We welcome you both. Your statements will be printed in full at this point in the record.

What I would suggest to you, is that you chat with us informally, each of you for 5 to 10 minutes, summarizing your thoughts and your written testimony, and referring to anything that might have piqued your interest during the last hour and a half.

After you have both had a chance to give us your thoughts, I am sure we will all have some questions for you.

Ms. Charles, why don't you start out.

STATEMENT BY KATHLEEN CHARLES, DEPUTY COMPTROLLER, NASA GODDARD SPACE FLIGHT CENTER, CHAIRMAN, BUSINESS PANEL OF THE AD HOC GOVERNMENT INTERAGENCY PANELS ON CIVIL OPERATIONAL REMOTE SENSING SATELLITE COMMERCIALIZATION

Ms. CHARLES. Thank you.

I was warned ahead of time that bells and whistles went off if I read the whole thing, so I have tried to condense even my oral statement.

Mr. SCHEUER. Very good.

Ms. CHARLES. I will still try to cover though the specific points that you asked me to address in your letter to me.

Mr. SCHEUER. Excellent.

Ms. CHARLES. For our report, the business evaluation panel addressed four issues. These issues were the administration policy of transfer as soon as possible, the best transfer mechanism, the simultaneous transfer of both Landsat and weather satellites, and fourth, the partial transfer of either or both of those systems.

The fifth section, which is where I think most of your questions came from, or your interest as indicated in the letter, would be a section that dealt with economics, legislation, terms and conditions of the transfer, and other areas on which information was requested in the RFI.

The first question that I was asked to address was one that has been addressed in the previous testimony, and that had to do with the market for remote-sensing data. The business evaluation panel

did find that a recurring theme of the responses to the RFI, was the opinion that the current market is indeed not large enough to provide for a profitable return on a major investment in either the land or weather satellite systems unless Government purchase guarantees or subsidies are provided.

Several respondents suggested that full commercialization of both of these systems or either one, must follow a vigorous program of market development, starting with the value-added users, which would eventually permit backward integration into data processing, data receipt, and ultimately, the operation of the satellite and development of sensors.

Nevertheless, the respondents' replies were quite wide ranging, and did not rule out commercialization potential outright. In fact, one company does plan to proceed with a land remote sensing program on its own.

The second area you asked me to address was the alternative commercialization approaches. Of the 14 responses, 7 supported a policy of gradual or partial commercialization of civil, weather, and land remote sensing systems. While it appeared that each of the respondents had a vested interest in their specific recommended approach, we did not view this as something that should necessarily diminish the value of their responses, but rather we viewed it as healthy and possibly broad based interest on the part of the private sector in the development of a private sector, remote sensing industry.

I will not go through the details of what the options were for gradual or partial commercialization. If you want me to go into that, I will do that during the question and answer session.

A third area which you asked me to cover had to do with the legal aspects of the transfer. The legal considerations addressed by our panel fell into two general areas: No. 1, the anticompetitive nature of proposals, and No. 2, the feasibility of proposed legislation and contract provisions.

With respect to the first area, a common concern expressed by six of the respondents was that in order for a private venture to be commercially successful, the private venture would have to be protected from competition, or receive special favored treatment in legislation or a Government contract or both. Our discussion focused primarily on a response to the RFI received from Comsat, which was the one response that specifically identified the protection or favored treatment required.

While Comsat did not request that the entity which owns and operates a civil remote sensing system be the only one authorized to do so in the United States they did propose a requirement that the U.S. Government purchase all of its data and data requirements from that entity for a minimum of 15 years.

The Department of Justice considered this to be a special advantage to that single entity which would in fact discourage competition. This would preclude purchase of data by the Government from other U.S. commercial entities or from other foreign systems, which could be very disadvantageous to those competing sources.

Several respondents were concerned that legislation or contracts which are anticompetitive in nature would cripple or destroy private ventures. It is probable that those private ventures that in

fact are subsidized today by obtaining, nearly free of charge, data and data products, and who then reproduce them for further sale at a profit, would be adversely affected.

They would lose their subsidy and would be required to respect the protection afforded private property, that being the data and the data products. We could not determine whether or not the acceptance of a proposal such as Comsat outlined would drive these private ventures out of business if they had to pay the price that would have to be arrived at in order to use the data.

The second general group of legal considerations dealt with the feasibility of proposed legislation and contract provisions. Here the discussion again was limited to Comsat since they were the only ones who identified specific provisions that would be required.

My prepared statement does go into more detail on those concerns, but I will highlight for you some of the issues. To the extent that the Comsat proposal could be read as suggesting that awards should be made under sole source justification to them, it is not clear that this would be permitted under current laws requiring competition.

Based on the record, there has not been a showing that only one private entity could do the work planned. It would be consistent with law and Government procurement procedures to competitively secure a contractor. I understand that the Department of Commerce now plans to do this.

With respect to the issue of protection of data and data products, we determined that the enactment of copyright laws protecting data and data products appears feasible. A policy of nondiscriminatory access to data could continue along side the requirement that the data be protected by copyright and by other regulation.

This is possible since the copyrighted data and data products could be sold, or under international agreements, provided free of charge. Those international agreements are a reference to the existing agreements with foreign countries whereby we provide them free weather data. What could be set up is a mechanism by which the Government would pay the commercial entity for the data, and then the Government would give them to the foreign countries, thereby honoring the existing agreements—that's possible.

The final point which your letter asked me to address dealt with arguments and evidence which surfaced during our deliberations with regard to the wisdom of commercializing weather satellites.

Of the 14 responses, approximately half objected specifically to commercialization of the weather satellites. The principal concerns raised were, first, that any foreseeable scenario would entail creation of a monopoly, and second, public health and safety, national security, and international relations issues.

Responses on the positive side varied. One of the respondents did not specifically address the wisdom, but did say that the time was right for the private sector to get into processing and distributing weather satellite data to the Government and to other commercial users.

Two other respondents again reflected implicit approval in their proposals of phased commercialization of parts of the weather satellite system.

Comsat argued strongly in favor of commercialization of the weather satellites and addressed the concerns with respect to national security and public health and safety, by proposing that the contract itself be structured in such a way as to obviate those concerns.

Mr. Chairman, that concludes my summary of my prepared statement. I would be happy to answer any questions.

[The prepared statement of Ms. Charles follows:]

Statement of

Kathleen J. Charles
Chairwoman
Government Business Review Panel
on
Industry Responses
on
Commercialization of Civil Remote Sensing Systems

before the

Subcommittee on Natural Resources, Agricultural Research
and Environment
and the
Subcommittee on Space Sciences and Applications

Mr. Chairmen and Members of the Subcommittees:

Last fall I was asked by the Department of Commerce to chair an interagency panel formed to review and evaluate the business and financial aspects of responses to the Request for Information (RFI) published by Commerce in the Commerce Business Daily. As I know you are aware, that RFI was published on September 10, 1982, and requested industry views on two issues with regard to the nation's civil remote sensing satellites.

The business review panel, which consisted of individuals from NASA, NOAA, and the Departments of Agriculture, Interior, and Defense, met on October 25, 1982, to receive copies of the responses and outline our strategy for the evaluation. One key operating principle was that we would not contact any of the respondents for clarification or additional information but would limit our evaluation to the immediate responses and any other data available generally, or incorporated by reference.

As mentioned earlier, the Department of Commerce RFI solicited industry views on two stated issues, which were:

1. "What is the best mechanism to implement the current policy of transfer of civil land remote sensing systems to the private sector as soon as possible?"

2. "Should the Administration consider simultaneously private sector transfer of both civil weather and land remote sensing systems?"

The RFI continued, saying "Private sector representatives are invited to present their views and expressions of interest on ownership and/or operation of the land and weather satellites and the likelihood of Government savings in either mode..." This request produced a considerable number of opinions on the stated policy of transfer "as soon as possible."

Accordingly, the business panel also evaluated the responses to the policy itself. Regarding "transfer," the RFI stated that responses might address both, either, or any part of either system. The latter language, in effect, also requested private industry views on partial transfer of civil weather and/or land remote sensing systems. The business panel therefore also evaluated responses to this issue.

Our report, then, addressed four specific issues--the Administration policy of transfer as soon as possible, the best transfer mechanism, the simultaneous transfer of Landsat and weather satellites and ground systems, and fourth, the partial transfer of those systems. A fifth section of our report addressed sub-evaluations dealing with economics, legislation, terms and conditions of transfer, and other areas on which information was requested by the RFI.

Mr. Chairmen, the written statement which I have submitted for the record is basically a summary of the report we provided to the Department of Commerce. In this oral statement, I will focus on the specific items you mentioned in your letter to me, namely, an assessment of the present and future market for remote sensing data and of the institutional alternatives for developing that market; the legal aspects of the transfer; and arguments and evidence presented regarding the wisdom of commercializing weather satellites.

Market for Remote Sensing Data

The business evaluation panel found that a recurring theme of the responses to the RFI was the opinion that the current market is not large enough to provide for a profitable return on a major investment in the total land and/or weather civil satellite systems unless Government purchase guarantees (subsidies) are provided. Several respondents suggested that full commercialization of either or both systems must follow a vigorous program of market development starting with the value-added users, which would eventually permit backward integration into data processing, data receipt, and archiving, as well as the ultimate development and operation of orbiting sensors. Nevertheless, the respondents' replies were quite wide-ranging, and did not rule out the commercialization potential outright. In fact, one company plans to proceed with a land-sensing program on its own.

One respondent, COMSAT, requested legislation that would provide for a transfer of both land and weather systems to a single firm, and the designation of that firm as the single source for all of the Government's weather and land remote sensing requirements. The simultaneous transfer of both systems was a condition of the outlined approach, to permit the revenues of the developed weather data services to reduce the financial risks associated with the land sensing data products.

Four replies which took exception to the policy of transfer "as soon as possible" indicated that, in the absence of a private market today, establishment of a single firm with Government guarantees or subsidies would be required. This arrangement would result in that firm's domination of the evolving domestic industry. Opposition to this monopoly aspect was repeatedly stated.

The General Electric Company indicated that land remote sensing systems are not ready for private takeover, primarily due to the insufficient definition of the market to sustain a private venture. RCA responded "... we, RCA, have been unable to determine an adequate market for Landsat data without significant contributions by the U.S. Government for the purchase of data (a form of subsidy)."

Alternative Commericalization Approaches

Of the fourteen responses, seven supported a policy of gradual and/or partial commercialization of civil weather and land remote sensing systems. While it appeared that each respondent had a vested interest in their specific recommended approach, the panel felt that this should not necessarily diminish the value of the responses, but rather be seen as a healthy and possibly broad based interest in the development of a private sector, remote sensing industry.

RCA recommended that the Government request firm proposals for a lease arrangement for all elements of the Landsat system and some elements of the civil weather system. The request should include a profit inducement to expand the market of national and international users of Landsat data. Their approach envisioned initially a lease approach, which would permit the gain of operating and marketing experience, thereby permitting Government and industry to better determine the details and viability of eventual private ownership.

The University of Massachusetts recommended a plan which featured step by step non-disruptive decentralization of the systems components, and creation of real market incentives for commercialization, which would obviate the need for federal incentives such as subsidies or data purchase guarantees. The plan calls for a gradual phase down of federal programs, except possibly for segments of the weather satellite system, with the end product being full

commercialization of the U.S. civil remote sensing system, without Government funding or subsidy at any point.

Control Data replied much along the line of the preceding recommendations of the University of Massachusetts. Control Data believes that transition to the private sector can occur and that transition should be gradual and begin with the ground segment. Control Data, however, states that user requirements are untested and, therefore, a high risk aspect of the transition is the viability of the marketplace. Transition success is contingent upon achieving a viable and self sustaining business entity. Accordingly, Control Data recommends a cooperative Government and industry venture to operationally validate the mechanisms for transition from a subsidized service-based operation to a product based "for profit" operation.

American Science and Technology (AS&T) advised of their plans to launch earth remote sensing satellites, and to integrate these satellites with the two Landsat-D satellites into the first U.S. commercial operational earth resources observational system. AS&T did not propose to develop or own any ground segment facilities; they would market the data from the Landsats and their satellites to any entity worldwide that installs a ground station and pays an annual access fee.

Space Services Incorporated of America stated its view that private ventures could replace the Government's Landsat programs and make a profit. Space Services, however, has no intention itself, to purchase or operate the Landsat system.

Terra-Mar responded that it would be very difficult to designate one company to assume the operation of Landsat with the subsequent responsibility for developing the market. Their view was that a company with both the appropriate operational and marketing skills does not exist. In the immediate future, improvements in data processing and data distribution will stimulate the value-added activity which is already occurring, thereby increasing revenues from Landsat data sales as new applications become established in the marketplace. Terra-Mar further stated that these increasing revenues would provide the strength among private sector operators to permit backward integration into data receipt and archiving as well as the development and operation of orbiting sensors. In this mode, healthy competition would encourage the creation of new applications software as well as encourage the companies with the best capabilities to assume a leadership role in developing a fully integrated earth resources information system.

The seventh and final response dealing with alternative commercialization approaches was Environmental Satellite Data, Inc., (ESD). This firm proposed

an immediate commercialization of segments of processing and distribution of GOES weather satellite data. ESD stated the following premises:

(1) A market exists for more highly processed weather satellite data.
(2) The market is willing to pay for such data.
(3) Private industry is capable of meeting the demand for this data.

Legal Aspects of the Transfer

The legal considerations addressed by the business evaluation committee fell into two general areas: 1) Anti-Competitive Aspects of Proposals, and 2) Feasibility of Proposed Legislation and Contract Provisions.

With respect to the first area, a common concern expressed by six of the respondents was that in order for a private venture to be commercially successful, the private venture would have to be protected from competition or receive special favored treatment in legislation or a Government contract or both. The panel's discussion focussed primarily on the COMSAT proposal which was the one that specifically identified the protection or favored treatment required.

While the COMSAT response to the RFI did not request that the entity which owns and operates the civil remote sensing system be the only one authorized to do so in the U.S., COMSAT did propose a requirement for the U.S. Government to purchase all of its data and data requirements from that entity for a minimum of 15 years. The Department of Justice considered this to be a special advantage to that single entity which would discourage competition.

COMSAT proposed that legislation be enacted stating that all additional or "new data" requirements of the U.S. Government be procured solely from COMSAT. This would preclude purchase of data from other U.S. commercial entities as well as foreign systems, which could be very disadvantageous if the competing sources were able to provide data not available through the COMSAT systems. COMSAT also proposed that legislation prohibit the U.S. Government from setting up a competing land data system.

COMSAT suggested that legislation be enacted (1) protecting data and data products against unauthorized use or misappropriation; (2) protecting data and data rights by copyright; and (3) protecting data and data rights from compelled disclosure under the Freedom of Information Act.

Several respondents were concerned that legislation or contracts which are anti-competitive in nature would cripple or destroy private ventures. It is probable that those private ventures that in fact are subsidized today by obtaining, nearly free of charge, data and data products and who then reproduce them for further sale at a profit, would be adversely affected. They would lose their subsidy and would be required to respect the protection afforded private property--the data and data products. It could not be determined whether the acceptance of the COMSAT proposal would drive these private ventures out of business if they had to pay the COMSAT price for use or reproduction of data and data products. Insofar as the COMSAT proposal requires the largest user in the market (the U.S. Government) to procure all of its data and data product requirements from COMSAT for 15 years, that indeed would destroy those private ventures which currently plan to provide the data and data products to the U.S. Government and would discourage any future competition or innovations.

The second general group of legal considerations dealt with the feasibility of proposed legislation and contract provisions. Here the discussion was solely limited to the COMSAT proposal since only that proposal provided some detail as to what legislative and contractual provisions were necessary. The provisions themselves are addressed in greater detail in my written statement, but I will now highlight some of the issues.

COMSAT contends that the Secretary of Commerce should select a private corporation based upon the interest expressed in response to the Secretary's request for information as well as the "technical and institutional qualifications, experience of the corporation, and preliminary negotiations carried to the point where the parties share confidence that a mutually satisfactory contract can be achieved." To the extent that the COMSAT proposal may be read as suggesting that the award should be made under a sole source justification to COMSAT, it is not clear that this would be permitted under current laws requiring competition. Based on the record, there has not been a showing that only one private entity could do the work planned. It would be consistent with law and Government procurement procedures to competitively secure a contractor by issuing a solicitation, as I understand Commerce plans to do.

COMSAT proposes a fixed price, minimum quantity, all Government requirements contract with COMSAT for at least 15 years for data and data products, with a mechanism for defining future Government requirements and a method for pricing them. The contract would contain an inflation escalator and provide commercial sales.

These are extraordinary procurement provisions. The provisions for 15 years duration and contracting for currently unknown but future data and data product requirements are particularly unusual.

COMSAT proposes that one of the provisions of the contract and legislation should provide "Payment of any liability of the Government which may accrue (including termination by the Government for its convenience)." Clearly legislation would be required to provide for the potential termination liability that may reasonably accrue if the Government terminates the contract for its convenience. It is not clear what else COMSAT seeks by contract or legislation by this quoted language. If it seeks indemnification for its own liabilities, this probably would be opposed by the Department of Justice which has been consistent in its opposition to indemnity unless an extraordinary justification can be made to support it.

With respect to the issue of protection of data and data products, the panel determined that the enactment of copyright laws protecting data and data products appears feasible. A policy of non-discriminatory access to data could continue along side the requirement that the data be protected by copyright and by other regulation. This is possible since the copyrighted data or data products could be sold or, under an international agreement, provided free of charge. The U.S. Government could pay the commercial entity which provides the data a reasonable price for that data transferred to foreign governments. That transferred data or data products probably would be protected from further reproduction by copyright.

With respect to remotely sensed weather data, in the past and currently, United States policy has been to make such data available at no cost. At the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE 82) held in Vienna August 9-21, 1982, the UNISPACE report stated the following on p. 43: "Access to data from operational meteorological satellites is free, and because many countries have become dependent upon this system, it is necessary to ensure continuation and intensification of such services." The United States, as a conference participant, agreed to this statement.

There is no United States law or treaty which would require that data remotely sensed by the United States or a private corporation must be provided in the future free of charge to all foreign governments which request it.

There are indeed, agreements between the U.S. Government and foreign governments which provide for the exchange of certain remotely sensed data and data products. Any legislation or contract dealing with the commercialization of remote sensing satellite systems should take these agreements and U.S. policy previously referred to into account, so that the United States obligations and policies will continue to be met by the entity which takes over the systems. Such legislation and Government contracts could also provide that the private entity should receive appropriate payments from the United States Government for the transfer of such data and data products to the foreign governments in accordance with the requirements in United States agreements with those foreign governments. Future international agreements could simply recognize that a reasonable charge would be imposed for such data and data products.

Commercialization of Weather Satellites

The final point which your letter asked me to address dealt with arguments and evidence which surfaced during our deliberations with regard to the wisdom of commercializing weather satellites.

Of the fourteen responses to the RFI, approximately half objected specifically to commercialization of the weather satellites. The principal concerns raised were 1) that any forseeable scenario would entail creation of a monopoly; and 2) public health and safety, national security, and international relations issues.

While one of the respondents, Environmental Satellite Data, Inc., did not specifically address the wisdom of commercializing the entire system, their response did state that the time is right for private industry to assume responsibility for processing and distributing weather satellite data for both Government and commercial uses. Their proposition was limited to certain segments of processing and distribution of GOES weather satellite data.

The University of Massachusetts response reflected implicit approval of at least partial commercialization, but proposed a gradual, phased approach.

COMSAT argued strongly in favor of commercialization of the weather satellites, stating that in their view, there are no issues that would bar commercialization, and that commercialization would bring about much needed improvements. Furthermore, commercialization is viewed by COMSAT as being consistent with the economic policy of the President, OMB Circular A-76, and the President's space policy. COMSAT addressed concerns with respect to national security and the public welfare by proposing that the contract itself be structureed in such a way as to obviate those concerns.

Mr. Chairman, that concludes my prepared statement. I would be happy to answer any questions you might have.

Mr. SCHEUER. Very good. Thank you for that very lucid summary of your very lucid, if complicated and somewhat technical, statement.

[Off the record.]

Mr. SCHEUER. We are back on the record now.

Now we will hear from Maj. Gen. Earl Peck.

STATEMENT OF MAJ. GEN. EARL G. PECK, USAF, DIRECTOR, INTELLIGENCE AND SPACE POLICY, CHAIRMAN, TECHNICAL PANEL OF THE AD HOC GOVERNMENT INTERAGENCY PANEL ON CIVIL OPERATIONAL REMOTE SENSING SATELLITE COMMERCIALIZATION

General PECK. Good afternoon, Mr. Chairman, ladies and gentlemen, I will make a few brief remarks extemporaneously, and avoid, if possible, repeating anything which Ms. Charles has so eloquently stated.

I think a little background might be of interest. I arrived back here in Washington from a NATO tour in the middle of October last fall, and learned from my predecessor that he had committed me to serving as chairman of the Interagency Panel to review the responses to the RFI which Commerce had placed in a Commerce Business Daily of September 10, 1982.

We actually convened 1 week later on October 26, and were given to believe, by virtue of the letter which Commerce had provided us, that time was of the essence. We were asked to complete the task as rapidly as possible. We evaluated the responses in approximately 1 week.

I would like to say that I worked with a very fine group of dedicated professionals representing most of the interested agencies in this town, and I think, in the time allotted, and with the material available, they did a commendable job.

We submitted the report in conjunction with Ms. Charles' report on November 10 to Michael Bayer. That was the last time, for all intents and purposes, that I have seen the report in any official channels.

We evaluated 14 responses to the RFI and they varied tremendously in sophistication, from a simple postcard to a very comprehensive proposal from Comsat. So it was difficult to apply uniformly all of the criteria against each of those proposals.

We did, however, attempt to use the criteria which had been supplied to us originally in the draft letter of the middle of October from Guy Fiske in Commerce.

In terms of technical feasibility, there was not enough information to establish if any were infeasible. There was nothing demonstrably infeasible in the responses.

We did determine in some instances that there were serious questions regarding national security, regarding adherence to international understandings if not agreements, and regarding continuity of data to the Government.

I understand that now our report is part of the official record of these subcommittees, and therefore I do not have to elaborate further on what is contained in the report.

I would be happy to entertain any questions you might have, Mr. Chairman.

[The prepared statement of Major General Peck follows:]

12 July 1983

WRITTEN STATEMENT
BEFORE THE
SUBCOMMITTEES OF THE
COMMITTEE ON SCIENCE AND TECHNOLOGY
BY
EARL G. PECK, USAF
THURSDAY, 14 JULY 1983

INTRODUCTION

I became the Director for Intelligence and Space Policy in OSD on 21 October 1982. My predecessor advised me that he had committed the office to lead an interagency technical review and evaluation of private sector suggestions on the commercialization of the Government's civil land and weather satellite remote sensing systems. A memorandum from the Department of Commerce confirmed this and urged me to serve as Chairman of an ad hoc panel to accomplish the technical review. My statement reflects the consensus from that interagency panel, and not the position of any executive agency in particular.

PANEL MEMBERSHIP

I acted as the Chairman of the ad hoc Interagency Review Panel with members representing the Intelligence Community Staff, Air Force, Navy, Joint Chiefs of Staff, National Oceanic and Atmospheric Administration, National Aeronautics and Space Administration, Office of the Secretary of Defense, Department of Agriculture, Department of Interior, Department of State, and the Office of Management and Budget.

OVERVIEW

The panel convened on 26 October and reviewed 14 responses to the Request for Information that appeared in the Commerce Business Daily (CBD) on 10 September 1982. No attempt was made to solicit additional information or clarification from respondents.

The responses varied in scope and sophistication from a handwritten postcard to a fairly comprehensive, all-inclusive submission. Criteria for evaluation could not, therefore, be applied uniformly to all proposals. However, the following general criteria were used, as applicable:

1. Responsiveness to federal needs;
2. Continuity of data services;
3. Feasibility; and
4. National security and foreign policy concerns.

Responses were grouped into four natural categories reflective of their basic thrust:

1. Those favoring near-term commercialization of existing civil remote sensing capabilities, entirely or in part.
2. Those espousing independent entrepreneurial interests and advocating a climate conducive to free market competition.
3. Those favoring government retention of the existing system, at least for the immediate future.
4. Other.

DISPOSITION OF THE REPORT

A similarly chartered panel to review business aspects, chaired by Ms. Kathleen Charles of NASA, convened at the same time but worked independently. We submitted the two panel reports jointly to Mr. Michael Bayer on 10 November 1982.

Mr. SCHEUER. Thank you General Peck.

Congressman Volkmer of Missouri.

We are going to be under the 5-minute rule.

Mr. VOLKMER. Right.

Mr. SCHEUER. So you can plan your time accordingly.

Mr. VOLKMER. I would like to see if either one of you disagree with a couple of statements here.

Let's take a natural monopoly. When we look at like a utility company serving a segment of our society, whether it is a city or an area, that is a natural monopoly.

Are we looking at a monopoly as, not the size of the market, but the character of the business. Do you agree on that?

Ms. CHARLES. Yes, Mr. Volkmer.

Mr. VOLKMER. Do you agree on that?

General PECK. I think essentially that is true. Without going any further, I think that characterizes it fairly accurately.

Mr. VOLKMER. Now is the Weather Service basically what we would say is a natural monopoly?

Ms. CHARLES. I would say, no.

Mr. VOLKMER. You would say, no.

General PECK. The Weather Service, of course, is only part of the question. I do not think that there is any proposal to commercialize the Weather Service.

Mr. VOLKMER. OK, I know.

Let's take the weather information then. Weather information.

General PECK. May I address that question further, sir.

Mr. VOLKMER. Sure.

General PECK. We regarded the idea of the transfer of the Metsat with some jaundiced eyes within the panel, I would have to say. I would say the reason for that stemmed from about four different factors.

One was the potential creation of a monopoly for which the Government would be almost the sole customer, with a certain attendant program and financial risk.

The second was the difficulty in accommodating the interrelationships which Mr. Bennett referred to, international agreements, military and civil satellite systems and so forth.

The third is that of one axiom we use "if ain't broke, don't fix it." The weather system is working pretty well.

The fourth is that we could see no good reason to interconnect the Landsat and the Metsat, that is, provide a cross-subsidy simply to keep an operation going which we may or not want to keep going. You can make a value judgment on that. We could not see any good compelling reason to do that.

In that sense, I would regard the weather system that we have now as the sort of natural monopoly practiced by Government to provide health, safety, and welfare. I cannot see any good reason for transferring the Metsats to the private sector.

Mr. VOLKMER. Going with that then, Ms. Charles, do you have any comment as to when you had the request for information, I believe as you analyzed it, you also came to conclusions?

Ms. CHARLES. Our report was more of a summary of the responses. However, there were some points which were evidenced in

such a large number of the responses that we did address them in the nature of conclusions.

With respect to the issue of whether the weather system, and the acquisition of weather data or whatever, constitute a natural monopoly, the reason that I would say, no, is that different people have different data needs. The data can be provided by a variety of sensors on a variety of platforms. In that respect I do not feel that that meets the definition of a natural monopoly.

Mr. VOLKMER. My last question is, in the answers to the request for information, in those was there anybody besides Comsat that proposed the purchase of the Metsat operation?

Ms. CHARLES. Comsat was the only respondent that proposed purchase of the entire system.

General PECK. They were the only respondent who proposed purchasing the whole system. There was one response which had to do with dissemination of some of the data from that system.

Mr. VOLKMER. But not the whole system?

Ms. CHARLES. Not the entire system.

Mr. VOLKMER. And their response also provided that they would too in other words, have the 15-year guarantee purchased back by the Government?

Ms. CHARLES. Yes, sir.

General PECK. Yes, sir.

In the response to the RFI, it was something like $300 million to purchase the assets, as I recall, and something like $350 million a year for 15 years to buy the Metsat information back.

Ms. CHARLES. Mr. Volkmer, I would like to clarify one aspect of that.

They did address the purchase of the existing assets, and, for a "fair price" they used the number of $300 million. But obviously that fair price would have to be determined through negotiation.

Mr. VOLKMER. Yes.

Ms. CHARLES. In addition, the annual costs of $315 to $330 million that the Government would pay over this 15-year period was also sort of a strawman estimate. That price would also have to be determined through negotiation between the Government and the ultimate contractor for the system.

Mr. VOLKMER. I now recognize the gentleman, Mr. McGrath, for a few minutes, and then we will have to recess and come back after the vote.

Mr. MCGRATH. No. 1, your job was a compilation of questionnaire type responses from 14 different firms.

Ms. CHARLES. Some of them were in the nature of responding to the questions that were asked. Some of them did not quite follow that format.

Mr. MCGRATH. In those responses, was there the bottom line that there was going to be a lower cost to the Government by doing this than we presently have now? Was that a bottom line conclusion?

Ms. CHARLES. There was only one response which provided enough information on which to evaluate that particular question. Our determination was that if you compare the cost of proceeding as they had outlined, and this again was Comsat, with the outlays that are currently projected in the Federal budget for the land and

weather satellite systems, it would not in fact save the Government money, but would cost the Government an additional $800 million.

Mr. VOLKMER. Would the gentleman yield on that?

When you did that, did you determine the tax consequences to the Government with the selloffs and the tax breaks that they would get?

Ms. CHARLES. No, sir. We recognized that that was an additional factor which would have to be considered depending on how they structured incentives and that kind of thing.

Mr. MCGRATH. You made no judgment then versus a total package of weather and land sensing, as opposed to just land sensing or weather?

Ms. CHARLES. No. One ground rule that we established at the outset was that we would operate with only the data that was provided in the response to the RFI, or incorporated by reference. Under that ground rule, we only had detailed information available from Comsat.

We had specific pieces on specific parts of the system that were addressed in other proposals and we did evaluate those and had no issue with them.

Mr. MCGRATH. Based on the responses, do you believe that we require framework legislation, or do you think that the RFP is sufficient in order to get the information we need in order to make a judgment?

Ms. CHARLES. It would depend on how the RFP is structured. I certainly see no reason why we could not, "we" meaning the Government, structure an RFP that addressed all the concerns that have been raised and articulated with the Department of Commerce, and evaluate the responses to those.

Now any scenario that has been laid out in these responses, particularly the Comsat one, requires presumably lots of new legislation or exemptions to existing legislation, or unusual procurement provisions.

Even though it might take us a while to do it in the Government, as opposed to in the private sector, it can be done. There is nothing inherently impossible in any one of these proposals.

Mr. MCGRATH. Thank you.

Mr. VOLKMER. General Peck.

General PECK. No, I would agree that there is nothing which can preclude us from developing RFP's which would satisfy the concerns of these committees and of the Government. They might require legislation, and after that they inevitably will.

Mr. VOLKMER. We are going to stand and recess for about 5 or 10 minutes.

[Recess taken.]

Mr. VOLKMER. The meeting will come to order. We'll start. I have a few more questions.

It has been stated that industry's response to the request for information should be viewed cautiously because industry could only respond fully and openly to an RFP.

Do you agree with this assessment?

Ms. CHARLES. We did have some indication, Mr. Volkmer, that there were some companies who chose not to respond to the RFI

but would in fact want to be considered in any discussion about an RFP, and responses to that RFP.

Mr. VOLKMER. Were some of the responses that you reviewed to the RFI pretty, I would not want to say simple in their information, but let's say, at least not a full response?

Ms. CHARLES. Most of the responses were not full, and "simple" would be a kind term for some of the responses.

[General laughter.]

Mr. VOLKMER. OK.

General PECK. I would agree with that assessment, Mr. Chairman.

Mr. VOLKMER. All right.

General, I have a couple more questions here.

Now your report says that there is considerable financial and program risk.

General PECK. What I attempted to do a few minutes ago, in response to your question about whether that constituted a natural monopoly or not was to answer that question, too.

There were four factors which led the panel to come to that conclusion, and I mentioned those. They had to do with a monopoly environment, and the difficulty in accommodating all the various agreements and understandings, implicit and explicit. In fact, the current system is functioning reasonably effectively and efficiently. We could not see any clear advantage to the Government in linking the Landsat to Metsat in the transfer process.

For that reason we regarded it as having considerable financial and program risk.

Mr. VOLKMER. I do not believe either one of you would say that your panels would say that we should cross-subsidize, in other words, should use the weather satellites, Metsats, and pay the extra money which you say may be $800 million in order to subsidize the purchase of the Landsat?

General PECK. If I may respond to that, I would say we would not say that unless you made a conscious decision--

Mr. VOLKMER. We made a policy decision.

General PECK [continuing]. To continue it for whatever purpose, that that would be a way of subsidizing its continuance.

Mr. VOLKMER. But we can continue it if we want to for whatever purpose the way we are doing it now?

General PECK. Yes, sir. We can.

Mr. VOLKMER. Can either of you tell me any benefits to commercializing the weather satellite that you can think of?

Ms. CHARLES. I will take a first crack at answering that question.

One that you might want to consider would in fact entail the issue of cross-subsidies, which you mentioned. But the benefit of doing that would ultimately be to establish a new private sector industry, which would be the land remote sensing industry.

Now that does not address all the issues which were raised by Mr. Bennett as to what the real market is and whether or not it is really out there. I do not think that there has been sufficient evidence presented to say that there is not a viable market out there for land remote sensing systems.

Mr. VOLKMER. If I may interrupt, let us just address the weather alone. Forget the Landsat.

Is there any benefit that you see to commercializing the Metsats? In other words, if we want to subsidize Landsat, we can do that anyway. In other words, we can say, OK, we will buy it back from you. Right now it is only costing us $23 million, but right now we are going to pay out $200 million for the same thing.

We could do that as a policy and take care of Landsat.

But on the weather satellites, can you give me reason, one good benefit, either to the public, international sector, national security, anything else, to commercial weather satellites, Metsats?

Ms. CHARLES. I would have to answer that I am not aware of any obvious benefits.

Mr. VOLKMER. General Peck.

General PECK. I would say if there is any potential benefit it is far outweighed by all the risks and disadvantages.

Mr. VOLKMER. General Peck, did your panel have any comments focused on that part of the administration's policy calling for transfer, I'll quote from the administration's statement, "to commercialize as soon as possible"?

General PECK. Yes; as a matter of fact there was a considerable reaction in the panel to that.

I think that you would find that as a group we were more or less disciples of Adam Smith. That is, we are not opposed to entrepreneurship. We are not opposed to commercialization. But we were concerned that rapid commercialization, transferring the assets intact to one entity, might result in stultifying competition, and might result in inhibition of research and development.

Therefore, we felt that the speed with which it took place might have an adverse effect. We believe that it is possible, gradually, to evolve into a commercialized exploitation of space. But we felt that the rapid translation of Government position to a private position, where it might be a single entity, might have an adverse effect.

Mr. VOLKMER. All right.

Now General Peck, also your report says one of the concerns which permeated our discussions of a non-Government monopoly environment, was potential lack of vigor in the R&D effort, and lack of incentive to adopt improvements which may materialize. This has been the case of the satellite communications field.

Now could you elaborate on how commercialization affected innovation in the satellite communication field?

General PECK. May I qualify that remark, Mr. Chairman?

I think the question really should be addressed to NASA, and I don't mean Ms. Charles. I mean other elements of NASA, the satellite communications area.

Mr. VOLKMER. I know.

General PECK. I can tell you, if you like, what I know of it from my interaction with those people.

When commercial communication satellites were authorized, the Government anticipated that state-of-the-art R&D would be pushed. That is, there would be continued movement in research and development technology improvement in new frequencies, for example, new antenna designs, and that sort of thing.

So NASA phased down their own research and development activities. Then they discovered that the sorts of things that they had

expected to ensue, really did not. Then they had to step back in and renew their efforts in research and development.

The commercial operators tended to focus on those things, understandably, which make money, such as increased services to users, increased numbers of frequencies, and that sort of thing.

But things like antenna design fell by the wayside, and were not pursued with any great vigor.

You could get a much more comprehensive answer, Mr. Chairman, from NASA, but that summarizes it.

Mr. VOLKMER. Do you have any comments on that, Ms. Charles?

Ms. CHARLES. I will answer in my capacity as a NASA employee. I will answer from this standpoint because I do have some background in working with the communications program at NASA.

I believe that arguments of the nature that General Peck just addressed were brought forward in the proposal that NASA proceed with the Advanced Communication Technology Satellite system.

There clearly was an absence in the private sector of any push to increase technology capabilities. That, therefore, led to us recommending the ACTS.

As General Peck mentioned, the companies tended to go for short term high return on investments, and R&D of the sort General Peck described didn't meet those criteria for them.

So we did have to step in and request a resumption of NASA's R&D activity.

Mr. VOLKMER. Do either one of you wish to comment on how could we avoid repeating these problems with the Landsat?

Ms. CHARLES. I have one thought on that, Mr. Volkmer, that surfaced during our panel discussions.

That is, that you could provide in the contract that you end up with, that the Government would in fact continue with R&D. That could be seen as a proper role for the Government to play, and the contract could make provisions for that. An example of the kind of provision you could make is you could specify that on any given satellite system that is flown, a certain percentage of volume or power, or whatever, be available for the Government to fly an R&D sensor, when it was available. The Government could pay perhaps the additive cost of integrating it on the operator's spacecraft. That's an option.

I think that there are probably other options that could be addressed and could be factored into the contract.

General PECK. Mr. Chairman, Ms. Charles virtually took the words out of my mouth.

I would say two things: If you are going to have anything resembling a commercial entity which looks like a monopoly of any kind, you must have continuing vigorous Government research and develop programs.

Further, the contract would have to assure that those advanced payloads would be carried on the commercial contractor's vehicles.

Mr. VOLKMER. I have no further questions, Mr. Chairman.

Mr. SCHEUER. Just one further question.

In conjunction with a long-term data purchase agreement, I think that there is some concern here that this could retard the introduction of new technology and various improvements in weather forecasting.

If the Government would sign a long-term data purchase contract with a company, what provisions could be included in that contract that could encourage the introduction of new technology and available state-of-the-art improvements during the life of that contract as they became available—without the Government getting unmercifully ripped off?

Ms. CHARLES. You could approach that a couple of different ways. One would be this option which would stipulate that the Government would be able to fly sensors on the system.

Another might be to make sure that the contract did not preclude the Government's flying an R&D sensor on a different system, for example, a test bed perhaps on the shuttle, and then ultimately on the private sector operator system.

With respect to the issue of not having the Government ripped off for the luxury of flying an R&D sensor on the private system, that would be indeed a very tough negotiating job. But we have some tough negotiators in Government procurement who I think would be up to the challenge. You would also have to make sure that you have access to the contractor's books to determine that the costs they propose to charge for flying that sensor are in fact valid and supportable costs.

Mr. SCHEUER. I think the history of the matter proves that Government negotiators are absolutely no match for private contractors when it comes to change orders that the Government wants either during construction or after the contracts have been signed.

This very building that we are in, went astronomically over cost. The reason was because the decision was made to engage in a number of change orders after the basic contractor field construction and architectural and engineering services and all that were signed.

It was not overages in the basic construction contract. It was the change orders that did it in the Rayburn Building.

I used to be in the construction business before I was a Congressman. I remember the history of that very, very well.

I think in your contract renegotiation, from the history of that in the armed services, the big conflicts and the big problems come in change orders.

When the Government wants to change after the contract has been signed, they want to be let off the hook. I say this without any criticism of the Government negotiators who are very smart, experienced people, but they do not have very much leverage. They want a change in the existing contract that binds them. So all of the leverage and all of the negotiating advantage is with the private contractor.

This is why I ask you, how, during the course of the 15-year contract—perhaps half or two-thirds of that time has gone by, and there is some spectacular new advance in the state-of-the-art, and the Government really wants to avail itself of that—how they avail themselves of that on some kind of fair basis without being, as I said before, unmercifully ripped off?

General PECK. Like Mr. Bennett, Mr. Chairman, I like your articulation of the problem, and I think you are absolutely right that the change orders are what kill you.

I think that focuses exactly on why my panel was apprehensive about whether or not this could be done successfully to the benefit of the Government. I am not certain whether it can be or not. But factors like that are the sort of thing which caused us to be concerned. Whether or not an ironclad contract can be developed which will assure that R&D goes forward and the Government takes full advantage of it, and anything that transpires in the future, are questions.

I am not certain that that can be done. It perhaps will take the RFP's to see what kind of responses we get to determine if it can be done.

Mr. SCHEUER. It is a case where the Government would be in the position of having its cake and eating it too. [General laughter.]

Mr. SCHEUER. The Government should want to have its cake and eat it too. The Government should want to have a firm contract, and the Government should insist on being able to take advantage in any major breakthroughs in the state-of-the-art. I mean that's in the public interest.

I just do not know how you do that, and that I see as the great peril and the great disadvantage of a long-term contract.

Ms. CHARLES. Mr. Scheuer, could I make one further comment on that?

I do not disagree with what both of you have said on change orders. We have ample history of being burned on change orders. I am not saying that what I am about to say is the only way to do it.

But certainly it is feasible to envision a situation where you are not talking about a change order to a contract which has all the specifications detailed, but you talking about a change order to a contract which at the outset provided that the Government would always have the opportunity to use a certain percentage of the volume and the power.

I mean, if you stipulate at the outset that the Government reserves for itself the right to use that, then it is not a change order of the type that you apparently ran into with the Rayburn Building and that we have run into on other satellite programs, because it is recognized at the beginning that you are going to, sometime downstream, use that capability.

So I think that there is a slight difference there. That is only one option.

Mr. SCHEUER. Yes.

You have both been excellent witnesses, very forthcoming, highly professional and extremely knowledgeable. We have thoroughly enjoyed your testimony. We appreciate your coming up here very, very much.

General PECK. Thank you, Mr. Chairman.

Mr. SCHEUER. We will adjourn until July 21, at 9:30 a.m.

[Whereupon, at 4:39 p.m., the committee recessed, to reconvene on July 21, at 9:30 a.m.]

THE COMMERCIALIZATION OF METEOROLOGICAL AND LAND REMOTE-SENSING SATELLITES

THURSDAY, JULY 21, 1983

HOUSE OF REPRESENTATIVES, COMMITTEE ON SCIENCE AND TECHNOLOGY, SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT AND SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS,

Washington, D.C.

The subcommittee met, pursuant to notice, at 9:42 a.m., in room 2325, Rayburn House Office Building, Hon. Harold Volkmer (chairman of the subcommittee) presiding.

Present: Representatives Volkmer, Scheuer, Brown, Nelson, MacKay, Andrews, Lujan, Walker, McGrath, Schneider, Lowery, and Lewis.

Mr. VOLKMER. The Subcommittee on Space Science and Applications and the Subcommittee on Natural Resources, Agriculture Research and Environment will come to order.

Today's hearing is the last of a series of five hearings exploring the subject of the commercialization of satellite remote sensing. The hearings began on April 14 when Secretary Baldrige presented the administration's position. On June 21 Ray Kammer described the commercialization process now underway.

Other than those two statements we have heard very little support for the commercialization proposal or process. The administration has indicated that they want to work closely with us, most recently in a letter from Secretary Baldrige. Without objection I want to put that in the record after my opening statement.

Nevertheless, they do not seem to be listening to signals from the Congress. For example, an amendment to H.R. 1718, the jobs bill, states, it is the sense of the Congress that the Nation's civil operational remote sensing satellites [Metsat and Landsat] shall remain under the National Oceanic and Atmospheric Administration. No effort shall be made to dismantle, transfer, lease, or sell any portion of these systems without prior congressional approval. There is similar language in title II of this year's NASA authorization bill which originated in the Science Committee.

My reading of the situation is that the Congress is unhappy with the idea of commercializing the Metsats, and that it would be much more comfortable with the administration proposal if it did not include weather satellites.

We have two witnesses today who should be able to help us decide whether or not we should commercialize the weather satel-

lites. Dr. Aksel Wiin-Nielsen, the Secretary General of the World Meteorological Organization, will comment on the global importance of weather satellites. The question we want to ask him concerns the present practice of free international exchange of weather data. Is this practice a matter of altruism or are there real benefits?

Our second witness, Mr. Richard Frank, former Administrator of NOAA, can also help us with this question. He can also help us with another question. It has been asserted that the present proposal is a continuation of previous policies, and Mr. Frank would be able to comment on that.

Our final witness is Prof. Tom Lillesand who is representing the American Society of Photogrammetry, and therefore represents a large and diverse group of users of Landsat data. We look forward to his statement.

This session completes our hearings based on the testimony which we will further analyze over the next few weeks. We may want to have further hearings on legislation. If we decide to do that after consultation with the members, I would expect to have hearings focused on specific legislation.

At this time I would recognize Chairman Scheuer of the other subcommittee.

Mr. SCHEUER. Thank you very much, Chairman Volkmer.

In this last day of hearings before our August recess, I want to say what a great pleasure and privilege it has been to work with you on this, and to cochair these set of hearings with you.

I have enjoyed every minute of it. Our staff have enjoyed working with your staff, Mr. Byerly, and it's been a very productive relationship. We appreciate the cooperation we have had all along the line.

I am not going to take very much time before we hear the witnesses except to say that I still have an open mind until the very last day of hearings is over, but having said that, there is a barely rebuttable supposition in my head that it doesn't make very much sense to commercialize the weather satellites.

The real issue in this debate is not whether commercialization of weather satellites makes sense, but whether the United States should act decisively to maintain its technological leadership in land remote sensing. I think it would be a tragedy if we let the French and the Japanese leap ahead of us, if we sat by like a helpless giant with our satellites up in the air petering out over a period of several years.

To me that is not the America that I know, and the America that I want to represent in Congress.

So the real question is, if land remote sensing is the crucial issue, what are the cost-effective options that face our country today to preserve our leadership?

I think we ought to get this other question out of the way with as much dispatch as we can, and get down to the nub of the question of how we preserve our technological leadership, and how we get on with the job of staying first in space. I don't mean that as just a cliche. There are lots of things where other countries have a comparative advantage.

Under the theoretical dictums of international trade, they should be doing their thing, and we should get on to areas where we have a comparative advantage. If we don't have a comparative advantage in high tech space operations, then we ought to fold our tent and sneak away into the night.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Scheuer follows:]

OPENING STATEMENT OF HON. JAMES H. SCHEUER

Thank you, Mr. Chairman.

Over the past four months, we have had a wealth of testimony on this issue, and, in the process, the two central issues that we need to resolve have become clear.

First, does commercialization of weather satellites make sense, or does it merely distract from the real issue of this debate—whether the U.S. Government should act decisively to maintain its technological leadership in land remote-sensing?

Secondly, if land remote-sensing is the crucial issue, what cost-effective options are available to us for preserving U.S. leadership?

I look forward to the testimony of Dr. Wiin-Nielsen, Mr. Frank, and Mr. Lillesand for the wisdom that they will provide in resolving these issues, and I would like to extend a special welcome and thanks to Dr. Wiin-Nielsen for taking the time and effort to be with us today.

Finally, let me say that it has been a pleasure and a privilege to co-chair this series of hearings with you, Mr. Chairman.

I hope that after today's hearing, the Members of the two Subcommittees can reach a consensus on how this important issue should be handled, and that we may reconvene the two Subcommittees after the summer recess to consider remote-sensing legislation.

It is critical for this body to take a lead role in this issue; without prompt action, we run the risk of allowing the U.S. to abandon its technological leadership in remote-sensing.

Thank you, Mr. Chairman.

Mr. VOLKMER. Thank you, Congressman Scheuer.

At this time we recognize Mr. McGrath.

Mr. MCGRATH. Thank you, Mr. Chairman.

I want to join the chairman in welcoming our witnesses to the final hearings in this series on the commercialization of weather satellites and land sensing satellites.

I might just react to what my colleague has just said, that I don't find there is any inconsistency between keeping our technological edge in R&D for land sensing satellites, and also going ahead with the commercialization.

I have been quite pleased with the testimony we have received from the previous hearings. At last week's hearing one witness presented us with an interesting new idea for establishing a value for land remote-sensing data. I found it to be quite a fascinating concept, and will be interested in the comments today from our witnesses on this idea.

I am pleased that we have before us today the Secretary General of the WMO. Many of us are extremely concerned about the international relations aspects of transferring these systems. I think the Secretary General's testimony will be quite valuable to the subcommittee.

I might also add that I am one of those who does not believe at this point in time that there is any market for or sense in transferring the Metsats to private industry.

Thank you, Mr. Chairman.

Mr. VOLKMER. Did any member wish to speak at this time?

Mr. WALKER. Mr. Chairman.

Mr. VOLKMER. Yes, Mr. Walker.

Mr. WALKER. Thank you, Mr. Chairman.

Mr. Chairman, I just would like to point out again that I don't find it surprising, having been at many of these hearings, to hear the contention made that the only way to assure the future is to increase, or at least stabilize the amount of Government power which is incumbent in our remote-sensing capabilities and in our space program.

But it seems to me that the one thing we have learned over this period of time is the fact that those who want to see space kept in Government hands are those who don't want to see power dispersed. That's the view of those who are tied to the past and cannot accept new ideas for our future.

Commercialization, whether we like it or not, is the root to the future in space. That's where we are going to be some day. The question is, are we going to be there in the near future or in the distant future. Those in Congress who tried to throw roadblocks in the path of commercialization are really denying us the future in the near-term.

I would hope that this committee ultimately will go on record as favoring more commercialization so that the future can be a bright one quicker.

Thank you, Mr. Chairman.

Mr. VOLKMER. Thank you, Mr. Walker.

At this time we will proceed with our first witness, Dr. Aksel C. Wiin-Nielsen, Secretary General, World Meteorological Organization.

Dr. Wiin-Nielsen, we welcome you, and your part of the testimony. The written statement you have been so kind to provide us with will be made a part of the record. You may either review the statement in total or you may summarize, however you so desire.

Mr. LUJAN. Mr. Chairman, may I include a statement in the record?

Mr. VOLKMER. If you wish to before we start, you may do so. You can just read it.

At this point in the record we will have the statement of Congressman Lujan of New Mexico.

[The prepared statement of Mr. Lujan follows:]

HONORABLE MANUEL LUJAN, JR.
HEARING ON SATELLITE COMMERCIALIZATION
JULY 21, 1983

THANK YOU, MR. CHAIRMAN. THE ISSUE OF TRANSFERRING THE REMOTE SENSING SYSTEM TO THE PRIVATE SECTOR HAS SHOWN ITSELF TO BE COMPLICATED AS WE CONTINUE TO HAVE HEARINGS. EVEN AFTER TESTIMONY OF OUR EARLIER WITNESSES, I HAVE QUESTIONS ABOUT THE FINANCIAL ASPECTS OF THE SYSTEM THAT I HOPE THESE WITNESSES WILL BE ABLE TO ADDRESS IN THEIR TESTIMONY.

THERE IS CLEARLY A STRONG MARKET INTEREST FOR GEOLOGIC DATA SUCH AS FOR OIL AND MINERAL EXPLORATION. BUT SINCE THIS DATA IS AVAILABLE FOR THE ENTIRE EARTH, I WONDER ABOUT THE NEED TO CONTINUE COLLECTING IT.

OF COURSE, ONE AREA WHERE REPEATED OBSERVATIONS ARE OF GREAT VALUE IS EPISODIC EVENTS SUCH AS VOLCANOES, FLOODS, ETC. THE RENEWABLE RESOURCES DATA IS CLEARLY AN AREA WHERE FREQUENT OBSERVATION IS OF VALUE. I AM CONCERNED THAT THERE IS NOT MUCH OF A MARKET IN THE AREA OF RENEWABLE RESOURCES NOW AND THAT MARKET IS NOT DEVELOPING. THE INTENSE INTEREST OF INDUSTRY AND OF THE FEDERAL GOVERNMENT, THOUGH, IS AN INDICATOR OF THE POTENTIAL.

WE HAVE HEARD AN IMPRESSIVE AMOUNT OF TESTIMONY ABOUT THIS POTENTIAL TECHNOLOGY. THERE HAVE BEEN EXCELLENT EXAMPLES

PRESENTED TO US OF PRIVATE FIRMS, SUCH AS OIL COMPANIES, ENJOYING EXCELLENT BENEFITS FROM LANDSAT. THERE HAVE ALSO BEEN EXAMPLES OF REMOTE SENSING APPLICATIONS FOR THE PUBLIC GOOD. SOMEHOW IT REMINDS ME OF THE INTRODUCTION OF THE TECHNOLOGY FOR THE TELEPHONE. IF THE TELEPHONE HAD BEEN DEVELOPED BY A GOVERNMENT AGENCY, A SUGGESTION TO TRANSFER THE SYSTEM TO THE PRIVATE SECTOR COULD HAVE INVOLVED HEARINGS DEBATING WHETHER OR NOT THE SYSTEM WAS READY FOR COMMERCIALIZATION, WHETHER OR NOT COMMERCIALIZATION WOULD RESULT IN A MONOPOLY, WHETHER OR NOT MORE RESEARCH WAS NEEDED, WHETHER OR NOT THE EARLY SYSTEM WAS RELIABLE OR ECONOMIC, WHETHER OR NOT A MARKET WAS READY. BUT I CAN ESPECIALLY IMAGINE A DEBATE OVER WHETHER THE TELEPHONE IS A PUBLIC GOOD THAT SHOULD BE SUBSIDIZED. THERE WOULD BE ARGUMENTS THAT THE TELEPHONE HAD WONDERFUL USES FOR EMERGENCIES -- THAT THE TELEPHONE HAD AMAZING POSSIBILITIES IN INTERNATIONAL RELATIONS -- AND THAT THERE WERE NATIONAL SECURITY ASPECTS THAT SHOULD BE CAREFULLY CONSIDERED. ON THE OTHER HAND, THERE WOULD BE GREAT COMMERCIAL GAINS FROM FIRMS BEING ABLE TO COMMUNICATE QUICKLY FROM COAST TO COAST. OF COURSE IN THE EARLY YEARS OF THE TELEPHONE, THEY WOULD NOT SEE THE MANY SPINOFF APPLICATIONS, SUCH AS ANSWERING MACHINES, TELEFAX MACHINES, PHONE COMPUTER HOOK-UPS, VIDEO CONFIRMING, ETC. -- AND THE SUPPORTING INDUSTRIES ASSOCIATED WITH THESE UNFORESEEN USES.

IN SUMMARY, I SEE GREAT SIMILARITIES. BUT THERE IS ONE MAJOR DIFFERENCE: THE TELEPHONE WAS DEVELOPED BY THE PRIVATE SECTOR; REMOTE SENSING WAS DEVELOPED BY THE FEDERAL GOVERNMENT. I WOULD LIKE TO BELIEVE WE COULD FIND A WAY TO TRANSFER THE LANDSAT TO THE PRIVATE SYSTEM WITH THE RESULT BEING A WIDELY USED TECHNOLOGY AND A HEALTHY U.S. INDUSTRY.

MR. CHAIRMAN, I HOPE WE WILL HAVE AN OPPORTUNITY TO DISCUSS THESE POSSIBILITIES WITH THE WITNESSES TODAY.

THANK YOU.

Mr. VOLKMER. Dr. Wiin-Nielsen.

STATEMENT OF DR. AKSEL C. WIIN-NIELSEN, SECRETARY GENERAL, WORLD METEOROLOGICAL ORGANIZATION, GENEVA, SWITZERLAND

Dr. WIIN-NIELSEN. Thank you very much, Mr. Chairman, and gentlemen of the committee.

I would like to summarize the written statement which I have deposited with the committee.

Let me say first of all, although it has been mentioned before, that I am the Secretary General of the World Meteorological Organization. I am very happy to be invited to these hearings on the important subject of meteorological satellites. I will now proceed with the formal statement.

My official status in appearing before you today is in the capacity of the Secretary General of the World Meteorological Organization. However, your subject of meteorological satellites is of great personal interest to me also.

My entire professional career has been spent in the field of meteorology as a scientist and educator and an administrator. As a scientist, I have worked for a number of years in the specialized field of numerical weather prediction, and during the past 20 years I have seen firsthand the remarkable development of meteorological satellites to provide the observations which are necessary to make weather forecasts by computers.

The World Meteorological Organization, which I shall hereafter refer to is WMO, is one of the specialized agencies in the United Nations systems. At present there are 152 members in the WMO. The organization has 110 years of successfully dealing with international cooperations in matters dealing with the weather.

It started as the International Meteorological Organization in 1873, and it became a part of the United Nations system in 1951.

To understand the role of the WMO in international cooperation, you need only go back some 140 years when Samuel Morse in 1843 invented the telegraph. This invention revolutionized the possibilities for weather forecasting, particularly storm warnings. It enabled one to send weather observations over long distances very rapidly, and made it possible to exchange weather information among countries.

From the very beginning of this period there has been a voluntary exchange of meteorological information among nations with no cost for such data received. This exchange of data among nations has been a firmly established principle in the WMO.

This principle is a basic necessity to modern weather forecasting procedures. Indeed the global weather forecasts now made at the World Meteorological Center here in Washington, as well as elsewhere in the world, require such observations from locations all over the Earth.

The principle of the free, no-cost exchange of meteorological observations has been adhered to unfailingly in peacetimes by all nations since the beginning of such practice 110 years ago. This is true even when no formal diplomatic relations were established. It should be noted that the People's Republic of China adhered to this

principle throughout the period when it was not formally a member of the WMO.

The principle operates on the idea that each nation contributes its data in a global exchange for the meteorological data of other nations. So it's an exchange principle. This forms the basic foundation of what is known as the Global Observation System which is one of the major components of the World Weather Watch, one of the major programs of the WMO. The data provided by each nation has been decided by each nation, but in a coordinated manner under the auspicies of the WMO.

Let me now consider the specific question of meteorological satellites. There now exists a network of five geostationary satellites operated by the European Space Agency, India, Japan, and the United States of America. This was first set up for the global weather experiment which took place in 1979, and it has now been operated for 5 years.

They have become, these geostationary satellites, an integral part of the operational World Weather Watch system. In short, we depend on satellite data for making severe weather warnings and other weather forecasts important to the health and safety of people all over the world.

On this point I would like to stress that there are now more than 1,000 stations around the world which can receive direct broadcasts from the meteorological satellites, and that these stations are located in some 125 different countries.

It is clear that when one considers changes to meteorological satellites, it is necessary to also consider how such changes will affect the rest of the world. If one is considering changes which could lead to a departure from the free, and I mean cost free, access for all to satellite data, it could have very strong repercussions throughout the meteorological global system. Indeed such a change could deal a severe blow to the whole internationally accepted basis for no cost meteorological data exchange.

Mr. Chairman, the electronic computers and artificial Earth satellites have dramatically changed the scientific knowledge about meteorology during the past 25 years. Weather forecasting services have improved as a result of these technological advances. Such services are considered operational in the sense that they are provided on a regularly scheduled basis.

However, it would be a mistake to believe that certain segments are routine and unchanging tasks which can be conveniently and precisely defined for purposes of pricing a commercial type service. This is particularly true of the more recently installed segments such as the satellites and the computer prediction models.

The extraction of meteorological information from satellite data is not, as yet, a standard engineering procedure. The history in this extraction process shows that success was gained when it was very closely integrated with the operational weather services of forecasting and severe weather warning.

There is a risk, there might even be a high risk, at separating the task of processing the raw satellite data for extracting useful information from the meteorological service, and could seriously jeopardize the quality of the final product.

For this reason, the World Meteorological Organization wishes to express its concern that control of the meteorological satellites by a private company, could result in a degradation of the quality of satellite derived meteorological observations which are by now the life blood of the world meteorological system.

The World Meteorological Congress completed its ninth biannual session in May 1983, just a couple of months ago. During this 4-week session, the meteorological satellites were discussed at length.

This Ninth Congress affirmed that the polar orbiting and the geostationary meteorological satellites are now a vital component of the World Weather Watch, and play a critical role for the operational services provided at both global, regional, and national levels.

During the past 4 years we have witnessed the efforts of operating countries to continue their operational satellite programs. We can express, I think, particular gratitude to the country of India for the launch of its Insat satellite. They have successfully demonstrated that meteorological satellite imaging among one of its major missions on their geostationary satellite.

We can also note that as the member countries bring their meteorological satellites to an operational state, there is a beginning discussion of further international cooperation beyond the voluntary data exchange. I have noted, for example, some informal discussions among the geostationary meteorological satellite operators on the topic of a common back up satellite. But these negotiations are still in the informal state, and no firm decisions have been made.

The operational meteorological satellites were discussed at great length also at the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space in August 1982. A number of delegations stressed the need to insure continuity of such capability services.

It is very important, in my opinion, to note that delegations of developing countries emphasized the importance of obtaining those assurances. The final report of the Unispace–82 conference underlined the need for all countries to continue to have free access to meteorological data.

The Conference recommended that WMO do a study on possible mechanisms whereby continuous availability of and access to meteorological satellite data could be provided. The recently completed WMO Congress endorsed the conduct of this study in the context of developing a long term policy and strategy for maintaining a global meteorological satellite system.

In conclusion, Mr. Chairman, I would ask that in your deliberations you also consider two other items. First, the contribution that the United States of America satellites make to the global network of meteorological satellites, and second, the importance of maintaining that global integrity to the health and safety of all people on the earth.

From the global perspective, it seems to me that the fundamental problem we now face is, therefore, how do we assure the continued and reliable operation which will provide at least the existing capability to the worldwide user community.

In order to define an approach to solving this high priority problem of operational continuity, we need to identify acceptable and practical means for nations to contribute to a cooperative system on a global scale.

If the present scheme which has existed in the international meteorological circles for more than a century no longer is to be considered suitable by the United States of America, and I must emphasize that I hope that such a change in policy is not seriously considered, but if it is, then I would hope that the family of nations can be involved in formulating any new approach to assuring the continued availability of vital weather data on a global basis for the use of all nations.

Mr. Chairman, this concludes my formal statement. I thank the committee for the invitation to appear before you as a representative of the World Meteorological Organization. I shall be pleased to try to answer your questions.

[The prepared statement of Dr. Wiin-Nielsen follows:]

Written Testimony submitted by Dr. Aksel C. Wiin-Nielsen
Secretary-General
World Meteorological Organization
Geneva, Switzerland

Presented to U.S.A. House of Representatives,
Committee on Science and Technology Joint Sub-Committee Hearings
on "Satellite Commercialization" on 21 July 1983

GENTLEMEN:

I am the Secretary-General of the World Meteorological Organization and I am most pleased to be invited to this hearing on the very important subject of meteorological satellites. I have a brief formal statement which I would like to make.

My official status in appearing before you today is in the capacity of the Secretary-General of the World Meteorological Organization. However, your subject of meteorological satellites is of great personal interest to me. My entire professional career has been spent in the field of meteorology as a scientist, educator and administrator. As a scientist I worked for a number of years in the specialized area of numerical weather prediction. During the past twenty years I have seen first hand the remarkable developments in meteorological satellites to provide the observations needed to make weather forecasts by computers.

The World Meteorological Organization (WMO) is one of the specialized agencies in the United Nations System. There are presently 152 Members States in the WMO. The Organization has 110 years of successfully dealing with international co-operation in matters dealing with the weather. It started as the International Meteorological Organization and became a part of the United Nations System in 1951.

To understand the role of WMO in international co-operation you need only go back about 140 years. In 1843 Samuel Morse invented the telegraph. This invention revolutionized the possibilities for weather forecasting, particularly for storm warnings. It enabled one to send weather observations over long distances very rapidly. This enabled neighbouring countries to exchange weather information. From the very beginning of this period there has been a voluntary exchange of meteorological information among nations with no costs for such data received. This exchange of data among nations has been a firmly established principle also in WMO. This principle is a basic necessity to modern weather forecasting procedures. Some measurements such as the barometric pressure or the amount of rainfall can only be done with instruments at the observation site. Yet, these measurements in one country are fundamental to understanding and predicting the weather patterns in a neighbouring country. Indeed, the global weather forecasts now made at the World Meteorological Centre here in Washington, D.C. requires such observations from locations all over the Earth.

The principle of the free, no cost exchange of meteorological observations has been adhered to unfailingly in peace times by all nations since the beginning of such practice 110 years ago. This is true even when no formal diplomatic relations were established. It should be noted that the People's Republic of China adhered to this principle throughout the period when it was not formally represented in WMO.

The principle operates on the idea that each nation contributes a portion of its data in a global exchange for the meteorological data of other nations. This forms the basic foundation of the Global Observation System which is a major component of the World Weather Watch. The data provided by each nation has been decided by each nation, but in a co-ordinated manner under the auspicies of the WMO.

Let us now consider the specific question of meteorological satellites. The pictures of cloud patterns taken by TIROS-I in 1960 were spectacular. I understand that this satellite returned more than 30,000 cloud pictures during the relatively short period of its operation. However, the USA recognized this as only the first step and you have followed through several generations of improved satellites to the present series of TIROS-N satellites.

The cloud pictures taken by the ATS-I satellite in a geosynchronous orbit enabled the meteorologists to follow the motion of the cloud patterns for the first time. Obtaining cloud pictures every 30 minutes from geostationary satellites meant that severe storms would no longer go unreported as had happened so often in the past. Today, geostationary satellites, such as the GOES satellites of the USA, operating at fixed locations around the earth routinely detect and provide information about all kinds of weather phenomena.

There now exists a network of five geostationary satellites operated by the European Space Agency, India, Japan and the USA. This was first set up for the Global Weather Experiment in 1979 and has been operating for about five years. They have now become an integral part of the operational World Weather Watch System. In short, we depend on satellite data for making severe weather warnings and other weather forecasts important to the health and safety of people all over the world. On this point I would like to stress that there are now more than 1000 stations around the world which can receive direct broadcasts from the meteorological satellites and that these stations are located in about 125 different countries. It is clear that when one considers changes to meteorological satellites it is necessary to also consider how such a change will affect the rest of the world. If one is considering changes which could lead to a departure from the free access for all to satellite data it could have strong repercussions throughout the global system. Indeed, such a change could deal a severe blow to the whole internationally accepted basis for no cost meteorological data exchange.

The World Meteorological Congress completed its Ninth quadriennial session in May 1983. During this four week session the meteorological satellites were discussed at great length. The resolution which was adopted by this Congress on WMO Satellite Activities is especially pertinent. I will quote two statements from this resolution:

(1) That due to technological developments during the last decade polar-orbiting and geostationary meteorological satellites have emerged as a vital component of the World Weather Watch and play a critical role for the meteorological and hydrological operational services provided by Members at the global, regional and national levels,

(2) That the continued operation of meteorological satellites, both polar-orbiting and geostationary, in their observation, data collection and dissemination roles is essential and must be ensured if the World Weather Watch system and the related applications are to be preserved"

The electronic computers and artifical earth satellites have dramatically changed the scientific knowledge about meteorology during the past 25 years. Weather forecasting services have improved as a result of these technological advances. Such services are considered operational in the sense that they are provided on a regularly scheduled basis. However, it would be a mistake to believe that certain segments are routine and unchanging tasks which can be conveniently and precisely defined for purposes of pricing a commercial type service. This is particularly true of the more recently installed segments such as the satellites and the computer prediction models.

The meteorological satellites in space do not actually measure any meteorological variables of the atmosphere. They only measure electromagnetic radiation which is indirectly related to the real meteorological quantities. The current state of processing the satellite data to extract meteorologically significant information from such space measurements is not a standard engineering procedure. Rather, this process involves a full application of the whole of meteorological science. The history in this extraction process shows that success was gained when it was closely integrated with the operational weather services of forecasting and severe weather warning. There is a high risk that separating the task of processing the raw satellite data

for extracting useful information from the meteorological service would seriously jeopardize the quality of the final product. For this reason, WMO wishes to express its concern that control of the meteorological satellites by a private company would result in a degradation of the quality of satellite derived meteorological observations which are the life blood of the world meteorological system.

When the Eighth WMO Congress met in May 1979, the twelve month Global Weather Experiment was only half completed. It was nevertheless already apparent that the global network of meteorological satellites was making a significant improvement in the operation of the World Weather Watch. The Congress expressed great appreciation to Members who had financed this contribution to the Global Weather Experiment. It also urged them to continue the operation of meteorological satellites after the Experiment was completed.

During the past four years we have witnessed the efforts of operating countries to continue their operational satellite programmes. We can express particular gratitude to the country of India for the launch of its INSAT satellite. They successfully demonstrated meteorological satellite imaging among one of its major missions on their geostationary satellite.

We can also note that as the member countries bring their meteorological satellites to an operational state there is a beginning discussion of further international co-operation beyond the voluntary data exchange. I have noted, for example some informal discussions among the geostationary meteorological satellite operators on the topic of a common back up satellite.

The operational meteorological satellites were discussed at great lengths at the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space in August 1982. This conference is referred to as UNISPACE-82. A number of delegations stressed the need to ensure

continuity of such capability services. It is very important to note that delegations of developing countries emphasized the importance of obtaining those assurances. The final report of the UNISPACE-82 Conference underlined the need for all countries to continue to have free access to meteorological data. The Conference recommended that WMO do a study on possible mechanisms whereby continuous availability of and access to meteorological satellite data could be provided. The recently completed WMO Congress endorsed the conduct of this study in the context of developing a long term policy and strategy for maintaining a global meteorological satellite system.

In conclusion, I would ask that in your deliberations you also consider two other items. First, the contribution that the USA satellites make to the global network of meteorological satellites, and second, the importance of maintaining that global integrity to the health and safety of all persons on the Earth. From the global perspective it seems to me that the fundamental problem we now face is therefore how do we assure the continued and reliable operation which will provide at least the existing capability to the worldwide user community. In order to define an approach to solving this high priority problem of operational continuity, we need to identify acceptable and practical means for nations to contribute to a co-operative system on a global scale. If the present scheme which has existed in the international meteorological circles for more than a century no longer is to be considered suitable by the United States of America - - and I must emphasize that I hope such a change in policy is not seriously considered - - then I would hope that the family of nations can be involved in formulating any new approach to assuring the continued availability of vital weather data on a global basis for the use of all nations.

Gentlemen; This concludes my formal statement. I thank this Committee for the invitation to appear before you as the representative of the World Meteorological Organization. I shall be pleased to try to answer any questions you may wish to ask me.

Mr. VOLKMER. Thank you very much, Dr. Wiin-Nielsen.

I am sure we will have many questions.

However, we do have a vote on at the present time. But we will proceed under the 5-minute rule.

Congressman Brown if you wish to take your 5 minutes at this time, if not I'll take mine. Either way.

Mr. BROWN. Mr. Chairman, it's up to you.

Mr. VOLKMER. If you are ready you may go on with your questions.

Mr. BROWN. I request to remain here, however, and to take my time while you are out voting. I can do that.

Mr. VOLKMER. All right. Then when Congressman Scheuer comes back we can continue on then.

You want to proceed then?

Mr. BROWN. Yes.

Mr. VOLKMER. I can stay for another few minutes before leaving.

Mr. BROWN. Dr. Wiin-Nielsen, first of all I want to say that I concur with the thrust of your statement, and I have a high admiration for your organization and the work that it's doing.

However, I think there are many Members of Congress who see a very real difference in the situation that existed prior to the space program and space satellites insofar as the exchange of world meteorological data is concerned.

Dr. WIIN-NIELSEN. Yes. I know.

Mr. BROWN. In the prespace era, it was obviously necessary for each country to engage in the exchange of meteorological data. No country would have access to the data of another country under normal circumstances. The only way you could get a global meteorological picture was by the free and full exchange of national data.

The situation today is that one country, predominantly the United States, provides the investment necessary to provide a global perspective to all nations, and provides that free to all nations.

It seems to me that that's a real difference unless the cost of maintaining that global system is shared in some equitable way.

Would you concur?

Dr. WIIN-NIELSEN. Congressman, I would say that, as I said in my statement, naturally satellites, whether we talk about polar orbiters or we talk about geostationary satellites, is a vital part of the whole global observing system.

On the other hand, satellites alone, if we were to consider that as a possibility, are not a sufficient observing system to satisfy present day needs for forecasts.

So, although I agree with you that the satellites have changed the situation from what it was in the old days, it has not changed it to such an extent that the satellites alone can provide all the information which is going to be needed.

To take an example of that, to evaluate, as I said in statement, the information you get in raw data from the satellite to useful meteorological parameters, still requires that we have a ground based system. Without that ground based system we really cannot make maximum use of the satellite information.

So it has changed, but it has not changed, in my opinion, to the point where the free exchange principle should be abandoned.

Mr. BROWN. You are evading my question to a degree, Dr. Wiin-Nielsen.

I am not suggesting we abandon the free exchange of data. I'm suggesting that we engage in an equitable process of financing the means by which that data is obtained.

Mr. WIIN-NIELSEN. Yes, sir.

But in that connection you will then also have to consider the contributions which are made by all our sectors to the satellite system.

As I mentioned, with the geostationary satellites, there are at the moment five of them. Two of those are provided by the United States. One is provided by the consortium which makes up the European Space Agency. Another one is provided by India. The last one is provided by Japan.

In the field of polar orbiters, the United States is providing its share, which so far has been two, possibly going down to one. The U.S.S.R. is providing two polar orbiters. So even in that sense there is some balance.

Mr. BROWN. You are not prepared to endorse the principle that there should be an equitable sharing of the cost of providing satellite data?

Dr. WIIN-NIELSEN. I think it is, Congressman, a question which needs a very serious consideration. I would very much like to see in the future a more equal sharing of the costs for the various satellite systems.

On the other hand, to be quite blunt about it, in the WMO with its 152 members, I also have to recognize that perhaps 20 nations of the world pay up toward 90 percent of the budget. So I suppose if you want to share, it is among those industrialized nations that the sharing, practically, can take place.

Mr. BROWN. You recognize, of course, that in the comparable situation involving communication satellites and the global system of Intelsat, that that is regarded as a cooperative system, and it is financed according to its use by the member nations.

You do not see a similar principle as being equitable or applicable in connection with meteorological data?

Dr. WIIN-NIELSEN. I think we already have examples of it on a limited basis if you look at the geostationary Meteorsat. This of course is a satellite where the cost is shared among the West European nations, some 10 to 12 nations.

I could well imagine that within the next few years that we may move in that direction also with respect to other satellites.

Mr. BROWN. Would your views on this subject be altered if someone were to suggest to you that the WMO be made the owner and operator of a world meteorological satellite system, and be responsible for the international dissemination of the data on the basis of how it would be most effectively used?

Dr. WIIN-NIELSEN. No, sir. I don't think I would change my mind on that because the World Meteorological Organization, in addition to the principles which I mentioned here, also has the principle that in research development and operations, will rely upon its members to come to an agreement of who does what.

The World Meteorological Organization as such is not an operating agency but is a secretariat.

Mr. BROWN. Do you see the possibility that instead of moving in the direction, as proposed by our present administration, of selling this whole system to a private operator to be used for profit purposes, the alternative of moving it toward a global system operated by either the WMO or an operating arm of the United Nations?

Do you see any merit to that alternative? Have you thought about it at all?

Dr. WIIN-NIELSEN. We have thought about that because in other components of the global observing system as it exists, the aircraft operations from wide-bodied jets, this is done by a consortium of members.

Similarly, there is presently on the drawing board, international agreements on floating buoys in the ocean. I could consider that in a timeframe of a half a decade to a decade that one may very well move in the direction of operating the satellite system as you suggest.

Mr. BROWN. I was trying to figure out what you mean by your sentence, Doctor, in which you say, in order to define an approach to solving this high priority problem of operational continuity, we need to identify acceptable and practical means for nations to contribute to a cooperative system on a global scale.

Can you clarify this statement?

Dr. WIIN-NIELSEN. I think at the moment, and for the time satellites have been with us, it has been operating with a few of the members taking the burden, that it can be foreseen that such a system may not exist for all future time.

In that case I think the WMO would be very happy to play an important role in creating international consortia for the launching and operation of satellites. This is one of the possibilities.

It is a difficult international problem to solve to create these kind of cooperative affairs.

Mr. BROWN. I was trying to nudge you in that direction, and you kept denying that that's the way you wanted to go.

Dr. WIIN-NIELSEN. I wanted to say that as long as the present system is operating and as long as there is the will to provide these satellites from a few member states, this is a satisfactory arrangement.

If that arrangement cannot continue, then I am 100 percent for working in the direction of internationalization.

Mr. BROWN. If I were a cynic, I'd say that what you are saying is that as long as you can get the dough out of the United States, let's keep on doing it. When the United States quits putting it up, we will look for a better way to handle it.

Dr. WIIN-NIELSEN. Sir, it is not only the United States, as I have explained, there are a few other countries engaged in that process. If you add all these countries together, those which participate in Europe, then that are some 12. So it is some 16 to 17 countries which make up the countries which pay for the major part of the present satellite system.

Mr. BROWN. What is the relationship between the Russian participation, and the participation of the Western nations?

Do they maintain their own separate global satellite meteorological system and exchange data with the rest of the world? Or are they a part of the system that we are familiar with?

Dr. WIIN-NIELSEN. The Russians at the present time operate two polar orbiting satellites called, Meteor. They are different from the U.S. polar orbiting satellites in their capabilities.

But they do form a part of what we call the global satellite system. Both the U.S.S.R. and the United States provide at the moment these satellites as part of the global observing system.

Mr. BROWN. With the equal access to the data from all the satellites?

Dr. WIIN-NIELSEN. Yes, sir.

Mr. BROWN. As far as you know there are no restrictions on our access to the Russian satellite to produce data, and likewise the Russians have full access to ours?

Dr. WIIN-NIELSEN. Yes.

Mr. BROWN. Do you consider the present system fully adequate from a technical standpoint, Dr. Wiin-Nielsen?

What I am thinking of here is that it seems to me that in the past we have had large areas of the globe where we were not generating adequate data in order to fully develop our numerical models for global atmospheric computational purposes and so on.

I am wondering now as to whether the world meteorological community feels that we have a completely adequate system from a technical standpoint in terms of its capability of generating all of the data required for continually upgrading our forecasting ability and so on?

Dr. WIIN-NIELSEN. I would like to answer the question in the following way. That if you look at the narrow field of meteorological activities, which deals with the forecasting over periods of a few days into the future, then the present system of satellites which exists is what I would call a minimal system. We can, so to speak, live with it.

But on the other hand, improvements in both the sensing capability, and in the parameters which can be obtained from the meteorological satellite system, there are some hopes and wishes for the future of improving the measurements which can be taken.

I would like to illustrate that by saying that before I had my present job, I used to be the director of the European Center for Medium-Range Weather Forecasting, and by medium-range we mean in that context for forecasts up to 5 or 6 days.

There is more and more evidence coming forward that to extend these forecasts further into the future, it will be necessary to have also good measurements of ocean parameters, sea surface temperatures and so on.

As you pointed out the ground-based meteorological observing system has big holes in it over the oceans, both the Atlantic and the Pacific in the Northern Hemisphere, and even worse of course in the Southern Hemisphere. We are indeed looking forward to having satellites which could give reliable measurements of the state of the sea, if I may put it that way. The most important parameter being the sea surface temperature because that determines the exchange with the atmosphere.

So it is a minimal system which we have. We would hope that in the future, maybe we don't need more satellites in numbers, but we need satellites which have different sensors on them in the future than they have at the present time.

Mr. BROWN. All right.

Just to restate that, you are saying that the present global meteorological satellite system is a minimal system, and the most important technical improvement would be to give it an ocean observing and sensing capability primarily aimed at sea surface temperature, but presumably also including other data including ocean temperatures and air temperatures, what do you call it in the vertical column—that would the highest priority for a technical upgrading in the world meteorological satellite system.

Is that correct?

Dr. WIIN-NIELSEN. That is correct for the purposes of weather forecasting over a medium range of 5 to 6 days up to a week.

Mr. BROWN. Thank you very much, Dr. Wiin-Nielsen.

Mr. VOLKMER. The gentleman from New York, Mr. Scheuer.

Do you have any questions?

Mr. SCHEUER. I just have one question, Mr. Chairman, because we have a long witness list this morning.

How would you compare the quality of the data received from the Russian weather satellites with U.S. weather satellites?

Dr. WIIN-NIELSEN. As I said a moment ago, they are different.

To elaborate on it, the Russian meteorological satellites are essentially providing pictures of what the satellite sees looking downward, that is pictures of clouds and so on.

On the other hand, the U.S. polar orbiting satellites provide a number of additional measurements. The most important of those being measurements of the outgoing radiation in various wavelength bands. This is very, very important for the meteorological community because these radiation measurements can be converted into vertical profiles of temperature which is the parameter which the meteorologists need to put into their prediction models.

So I would say that the U.S.S.R. satellites in this regard are less useful than those we have from the United States at the moment.

Mr. SCHEUER. You may have hit on this while I was voting.

Is any effort being made to achieve a more sort of systematic upgrading and a consistency in all of the countries that are providing us inputs?

In other words providing the best possible system and then hoping that all countries will adopt it.

Dr. WIIN-NIELSEN. They can convey and say the design of satellites.

For meteorological purposes, heretofore, has been mainly a decision by the country which launches and operates that satellite.

I think it would be a mistake to say that we arrived at the stage where the international community has a lot to say about what goes on a particular satellite. That is not to say that there is limited consultation. I am very much aware on some of the U.S. satellites there are sensors which by that oral agreement between the United States of America and the United Kingdom, for example, the United Kingdom has some instruments which are flown on U.S. satellites by agreement.

But if you think that the World Meteorological Organization with all the members present would decide on what sensors should be on the next satellite, then we have certainly not arrived to that as yet.

Mr. SCHEUER. Thank you, Mr. Chairman.

Mr. VOLKMER. The gentleman from New Mexico, Mr. Lujan.

Mr. LUJAN. Thank you, Mr. Chairman.

Dr. Wiin-Nielsen, you are of course opposed to the privatization of the weather satellite system, and I can understand that. As a matter of fact, because there has been so much concern about it, I rather doubt the administration is going to recommend that we privatize the weather satellite system.

However, I have difficulty in reconciling that decision with the decision that we have made in other areas. For example, one of the things that seems to be catching hold is the whole question of user fees. We recently passed a 5-cent gasoline tax so that the users of the highways would end up paying for them.

On barges we have made some charges there. Knowing some other committees that I am involved in, particularly with water, the actual cost, the law has been changed so that it reflects the actual cost to the Government, and the Government is reimbursed by the users.

I am sure that there are billions, if we spent $250 million on the satellite weather system, worldwide it's got to be billions.

I cannot rationalize why a television station, for example, should get their weather information for free. They have to pay for all kinds of other news. It would seem to me like it would be just like anything else. They want to be first, so they would be willing to pay for it. We could transfer into the private system.

What makes this different than any other kind of user fees?

Dr. WIIN-NIELSEN. Well, sir, I think you will have noticed that I am here to represent the international meteorological community. I have, of course, to be somewhat careful with respect to the decisions which the United States may make under its own sovereignty. This we leave to you gentlemen to do.

However, I would say that if there were to be a user's fee, as you call it, or a charge for the exchange of meteorological data in the international arena, which as I have said, has never been in existence, I think you are opening up in an area where you would charge for other countries using the data which you obtain through your various systems. And of course immediately you would find that the other members of the international meteorological community, indeed of the World Meteorological Organization, would do likewise.

This would lead to such an entirely new situation that it would really shake the very foundation of the international system as it has existed so far.

I think one may also look upon that, not only from the point of view of complications, but also from the point of view whether or not it really pays for an individual member of the World Meteorological Organization to change that international policy which has operated so well for so long simply because the time will never happen, in my opinion, that any member of the World Meteorologi-

cal Organization could consider itself as independent of the meteorological data from the rest of the world.

As I tried to explain before, if you have to make the forecasts even for the users inside the United States, you cannot do that without having access to global data. So while you may decide to charge internationally, you would then also have to pay internationally to obtain the data from the rest of the world. And if you work on that basis, where basically it's necessary to make a cost benefit analysis of that situation, although that in my recollection has never been done in detail, I doubt very much that you would come to a result which would be beneficial because the rest of the world is still pretty large as compared to the United States of America.

Of course the same would apply for any other member. So I think that while in principle, Mr. Congressman, I understand the concern you have that in other areas also a user's charge is levied for services, why shouldn't it be in meteorology? The principle, so to speak, is very much worth considering. All I am saying is that the bottom line, as far as I can see, would arrive in the fact that as much as you gained by selling your weather data, as much you would have to pay to get what you now get for free.

Mr. LUJAN. Let me pursue that a little bit.

Supposing we just turn over the satellite system to the WMO, and you can operate it either through contributions from countries, or as I suspect in the final analysis you would have to charge for some of the services.

Would that be appealing to you if we just said, we will write it off, as would be proper I believe? It's been researched and that kind of expenditure is certainly proper for Government. But now, you know, the applications of it, we'll just turn it over to you. We'll give you the satellite system, and you operate it, whether it's through contributions through the United Nations or whatever.

What do you think of that?

Dr. WIIN-NIELSEN. Well, if that were to happen, sir, then of course to be able to operate, and now I am talking about everybody to do that, because that would mean that we would then have an internationally operated satellite system consisting, as I explained before, at least of the minimal system which we have at the moment. That is about three or four polar orbiters, five geostationaries. If you add the cost of operating that together it would have to be done under the auspices of the World Meteorological Organization.

Then of course the World Meteorological Organization would have to pay for that. Now how does the World Meteorological Organization get its money? Well, it does so by having an assessed budget to which each member contributes according to its size and gross national product. And I may mention in this regard that at the moment the United States of America pays just below 25 percent of the WMO budget for running the secretariat.

If that same formula was going to be used for the operation of the satellite system, then again you may do your check and balances. And I think that once you have done that you might consider a second time if you really were willing to give us the system.

Mr. LUJAN. It would of course include everybody else turning it over.

Dr. WIIN-NIELSEN. Yes.

Mr. LUJAN. It couldn't just be one nation unilaterally turn it over to the WMO. The other countries that have their satellite systems would have to do it.

That just occurs to me that eventually WMO would end up charging for those services, and that perhaps would have the same result that we don't have those heavy expenditures.

This whole thing comes about because of our deficits, of course, which you understand in trying to reduce those deficits, how best we do that?

Dr. WIIN-NIELSEN. There have of course been talks about internationalizing some of the satellites. There have been—it has been suggested that if the United States of America goes from two polar orbiters to one polar orbiter, that of course is a serious reduction because that means that the frequency with which we get the data now goes down to half of what it was before.

Therefore, the idea has come forward, could one, on an international basis, finance the other satellite. I think these questions are very worth analyzing. And such a study could certainly be made. I think one would have to wait until one has a detailed study before each member of the WMO would make its recommendation on that.

Mr. LUJAN. Does everybody belong to the WMO?

Dr. WIIN-NIELSEN. Well, we have 152 nations. It is just about everybody. But there are a few little countries here and there which do not belong to the WMO. Island states in the Pacific and so on having no meteorological services and not much interest in the weather because it is always the same.

Mr. LUJAN. They get it from TV for free.

Dr. WIIN-NIELSEN. Indeed, yes.

Mr. LUJAN. I am reminded of when the shuttle didn't land in California. We were kidding about having a rain dance with that land of white sands in New Mexico. And it turned out to be a sandstorm the day, you remember that the—so this friend of mine, who runs an Indian reservation asked if he could—we stayed there in the reservation—he asked if he could go with us the next day. And he guaranteed to the NASA officials that today was going to be a perfect day.

And the NASA official said, well how do you know that? And he said, well I heard it in a little black box this morning when I got up. [General laughter.]

So that's another way that you can look at it.

Thank you very much.

Dr. WIIN-NIELSEN. Thank you.

Mr. VOLKMER. Mr. Lewis.

All right.

Mrs. Schneider.

Mrs. SCHNEIDER. I have just one question so that I am not redundant on the other questions and remarks that have been made.

I wonder if you could elaborate a little bit. You state in your prepared statement here that the control of meteorological satellites

by a private company would result in degradation of the quality of satellite derived meteorological observations.

Is that just a general opinion? Or can you substantiate that with some specific examples of how private control, as opposed to Government jurisdiction, has resulted in poor quality?

Dr. WIIN-NIELSEN. Well, let me say that I probably—if I had written the statement today would have said "could" instead of "would"—could lead to that.

Mrs. SCHNEIDER. That changes the whole ball game.

Dr. WIIN-NIELSEN. Well, it does change it a little bit.

But let me, nevertheless, elaborate on that. It has to do with the fact that for meteorologists to make weather predictions both on regional and global scales, what is needed is information, measurements ideally, of the atmospheric parameters. That is, temperature, humidity, pressure, wind, and so on.

Now if you look at what a satellite can do being outside the atmosphere circling the Earth, then of course a satellite cannot measure the profile of humidity or the profile of temperature directly. It can, however, measure radiances in various wavelength bands. And it is then the task of the meteorologists to convert from these measurements to those parameters which are really needed.

Now that is not a problem which has a unique solution. In other words, you have to have some ground truth to do that, and you have to have a choice between various procedures, various techniques because it is not like 2+2=4. It is much more complicated than that.

And therefore, I think the concern which we have is that if that was turned over to nonmeteorologists to do that, then the experience shows that it could be done in a less-than-100-percent efficient way. And therefore, we do have the opinion that the extraction of useful meteorological information from the raw data you get from a satellite does require meteorological expertise.

Now that meteorological expertise, of course, as long as that is provided then our concern would disappear.

Mr. SCHNEIDER. Thank you very much.

Mr. BROWN. Mr. Chairman.

Mr. VOLKMER. Yes. You want to follow that?

Mr. BROWN. Could I be recognized for just a comment?

Mr. VOLKMER. Yes. Sure.

Mr. BROWN. Mr. Chairman, this line of questioning has raised an interesting point about the relative costs of certain alternatives, ranging now from privatization to internationalization.

I am interested in possibly having the economic aspects of this latter alternative, which I raised and Mr. Lujan raised, explored by NOAA and some sort of tentative report made.

It seems to me, and I don't have the exact figures, but if we are now paying say half the cost of the global satellite system, and it amounts to say $100 million a year, and that may be just completely wrong, but if we were to internationalize this and pay our share as indicated by Dr. Wiin-Nielsen of 25 percent, we would save $25 million a year, which is part of the goal that this administration is seeking.

Furthermore, if I may redraw the parallel with Intelsat, which does a similar operation in the communication field, Intelsat actu-

ally contracts for the operation of its system to a private United States firm, Comsat General. We achieve both goals in effect if we move down this kind of a path.

I would like to see at least a rough analysis of the economics of that made if the chairman would agree to that.

Mr. LUJAN. Would the gentleman yield for just a minute.

What's the budget of WMO, the annual budget?

Dr. WIIN-NIELSEN. The annual budget of WMO is one of the smallest you have in the whole of the U.N. system. It is below $20 million a year.

Mr. LUJAN. That would mean that we would pay $4 million. The satellite system costs us $250 million a year.

Mr. VOLKMER. Oh, boy.

Mr. LUJAN. M-m-m-m.

Mr. VOLKMER. Well, I disagree with that.

Mr. BROWN. WMO's budget would go up if they were going to operate the satellites.

Mr. VOLKMER. Oh, yes. [General laughter.] Additional satellites.

I have several questions.

Mr. SCHEUER. Mr. Chairman.

Mr. VOLKMER. Yes.

Mr. SCHEUER. Going off the record——

Mr. VOLKMER. Yes. Off the record.

[Off the record.]

Mr. VOLKMER. We are back on the record again.

I would like to like to ask you along this line——

Dr. WIIN-NIELSEN. No comment, sir. [General laughter.]

Mr. SCHEUER. That was a rhetorical question. [General laughter.]

Mr. VOLKMER. Along this line of questioning, is there any other country among the 152, is that the number of member nations——

Dr. WIIN-NIELSEN. Yes.

Mr. VOLKMER [continuing]. In which the meteorological service is privatized, is done by private, not by the public or the Government? In any one of those countries?

Dr. WIIN-NIELSEN. I do not think so. I cannot think of a single country among all of the them where there would be privatization of any of the major meteorological operations.

Mr. VOLKMER. I am talking about meteorological gathering services. The gathering of the data, et cetera, like that in providing the data?

Dr. WIIN-NIELSEN. No. It is done on a Government basis in every single one of the countries as far as I know.

Mr. VOLKMER. All right.

Dr. WIIN-NIELSEN. I think this is pretty accurate.

Mr. VOLKMER. The World Meteorological Center here is Washington, D.C., is that a part of your organization, or is that a part of our Government operation?

Dr. WIIN-NIELSEN. But of course it is part of your Government.

Mr. VOLKMER. Right.

Dr. WIIN-NIELSEN. There is no doubt about that.

But the World Meteorological Organization has designated some few places to be world meteorological centers for purposes of the exchange of data.

Mr. VOLKMER. All right.

Dr. WIIN-NIELSEN. And there are at the moment three of those. There is Washington, D.C. There is Moscow, U.S.S.R. And there is Melbourne, Australia. These are the world meteorological centers.

Then the system goes to regional centers and then to national centers.

But Washington is recognized as a world meteorological center.

Mr. VOLKMER. If I—let's put it this way—let's say that—let's take the country of France, let's say, and they—how do they obtain the information that they need from the data given out by the U.S. geostationary satellites and also the polar satellites?

Dr. WIIN-NIELSEN. Well, under the coordination of the World Meteorological Organization, there is something called the global telecommunication system. This global telecommunication system connects, first of all, the world meteorological centers which I just mentioned, and then branches in the system, goes off to the regional centers.

So France, in your example, Mr. Chairman, would tap off the global telecommunication system, which connects Washington to Moscow. They tap off the information which they need and which is on the global telecommunication system.

And the information which is on the global telecommunication system, this is an agreement among the nations of what they are putting on. And the United States has at one time said in the WMO, we provide these data for the international exchange.

Mr. VOLKMER. About how old is that data by the time that France would receive it?

Right now there is data coming in at Wallops Island and undoubtedly going into the world center here in Washington.

Is that immediately communicated right back out to the regional centers?

Dr. WIIN-NIELSEN. It is communicated right back out.

And in most meteorological centers you wait for gathering the data which you need for your forecasting for a few hours.

If you need to make a forecast for tomorrow, then you don't wait for the whole globe because that is not important.

But if you need to make a global forecast, then you wait something like 6 to 8 hours. Then you have gathered the data which you need. It goes very fast.

Mr. VOLKMER. And that data would come not just from the United States but from your own satellite, the geostationary satellite, from India and everyplace else if you wanted to?

Dr. WIIN-NIELSEN. That's correct.

Mr. VOLKMER. I would like to get back to one fundamental principle.

You state the principle of free exchange of data has been adhered unfailingly for 110 years. Now I presume that there must be a reason for that.

And I want to ask if the reason is that under this principle everyone gains?

Dr. WIIN-NIELSEN. Yes. I would say that everyone gains because nobody can exist in the meteorological world without the data from the others. So they gain, yes.

Mr. VOLKMER. Now if everyone gains then is it not—it's not really altruism then on the sharing of the information. It's just the

opposite—that the free exchange is in our own best interest for this country.

Is that correct?

Dr. WIIN-NIELSEN. Well, it is—yes, it is correct, sir. Because if you are in the Arctic, I have been associated with a forecasting center which is under an obligation to provide forecasts for 5 or 6 days into the future, then of course it is in your interest to fulfill your task which you cannot do without receiving the data from elsewhere.

So it is in your own interest that this free exchange system continues.

Mr. VOLKMER. Then wouldn't we be the losers if we decided to further adhere to this principle but to start charging for data?

Dr. WIIN-NIELSEN. I think so. That would, as I have explained before, touch a system which has worked well. And if one wants to change that it would lead to such complications that everybody who is in the system would be losers.

Mr. VOLKMER. Now there has been some people posing that we only have one polar orbiting weather satellite system, changing from two to one.

Now what impact would this have on the rest of the world, particularly the developing nations?

Dr. WIIN-NIELSEN. Well, if you have one polar orbiter instead of two, that means that you receive information half as often. And that of course means in turn that continuity is broken.

And in the developing countries where most, if not all, now have their read-out stations where they can take the automatic picture transmission and so on, they rely for aeronautical purposes very much upon the pictures which are obtained from the polar satellites.

They will, in other words, be brought into a situation where they have from that source half the information of what they had before, and therefore, they would be worse off.

Mr. VOLKMER. All right.

What possibility would there be regarding a joint funding for a second—let's say we went to one—for a second polar orbiter?

Dr. WIIN-NIELSEN. Well, it would be a very interesting thing to explore if one could use that as a test case for internationalization. And I have heard that there would be interest in doing that.

I think the way in which one would have to go about it would be that under the auspices of the World Meteorological Organization, one would cord together those countries who would feel that if the United States went down to one polar orbiter that the loss would be so great that they would be willing to pay into a system to provide the second orbiter.

We haven't quite arrived at that stage yet. But we may get there in the very near future. I would like very much to try the WMO hand to see if one could internationalize it.

Mr. VOLKMER. In other words, it may be worth exploring the possibility?

Dr. WIIN-NIELSEN. Very much so.

Mr. VOLKMER. Now the U.S. weather satellites currently broadcast satellite weather data to many nations of the world through the automatic picture transmission program.

How many nations make use of this program? If you can't tell us offhand could you get us the information?

Dr. WIIN-NIELSON. Well, it's some more than 100.

Mr. VOLKMER. More than 100.

And how important is that to the weather forecasting in those countries which use the program?

Dr. WIIN-NIELSEN. Well, this is extremely important particularly for the aeronautical and other purposes. I think that it is above all very important for those countries which are situated in a place where the standard ground based meteorological network is very sparse.

And therefore, in that situation these countries can really only rely upon what they get from the APT.

Mr. VOLKMER. Thank you.

The gentleman from Florida, Mr. MacKay. Do you have any questions?

Any other questions?

Mr. BROWN. Mr. Chairman.

Mr. VOLKMER. Yes.

Mr. BROWN. Could I just reiterate my previous request that the committee direct a letter to NOAA?

Mr. VOLKMER. Well, I'd like to confer with the gentleman from New York about that first since this is a joint hearing and he has the jurisdiction over NOAA.

Mr. SCHEUER. Yes. We would be very happy to do that and we will work with the gentleman from California to prepare such a letter in a form that is satisfactory.

Mr. BROWN. I don't want it complicated, but I just want a consideration of this alternative in a rough analysis.

Mr. SCHEUER. In a rough analysis?

Mr. BROWN. Yes. Right.

And the cost factor.

Mr. SCHEUER. We will ask them for more than a rough analysis.

Mr. BROWN. OK.

Mr. SCHEUER. Thank you very much, Mr. Chairman.

[The requested report is printed in the appendix.]

Mr. VOLKMER. Before we go the next witness, Dr. Wiin-Nielsen, do you have any further comment that you would like to make?

Dr. WIIN-NIELSEN. No, sir.

I am happy that I have been able to answer most of your questions.

Thank you very much.

Mr. VOLKMER. I thank you very much for coming here today. And you have been very informed and very helpful in our deliberations.

And I can't emphasize enough how much we appreciate your being here.

Dr. WIIN-NIELSEN. Thank you.

[Questions and answers submitted for the record follow.]

المنظمة العالمية للأرصاد الجوية
مكتب الأمين العام

WORLD METEOROLOGICAL ORGANIZATION
OFFICE OF THE SECRETARY-GENERAL

ВСЕМИРНАЯ МЕТЕОРОЛОГИЧЕСКАЯ ОРГАНИЗАЦИЯ
Бюро Генерального секретаря

世界气象组织

ORGANISATION MÉTÉOROLOGIQUE MONDIALE
BUREAU DU SECRÉTAIRE GÉNÉRAL

ORGANIZACION METEOROLOGICA MUNDIAL
OFICINA DEL SECRETARIO GENERAL

No: 26926/S/VIS

Annexes: 2

C 11/41/21/3 46

GENEVA 5. August 1983

Dear Mr. Volkmer,

I appreciate the compliments you expressed in your letter of 25 July 1983 about the testimony I gave at your hearings on civil space remote sensing.

We have considered the questions you presented in your letter and have attempted to answer them to the best of our ability within the Secretariat of the World Meteorological Organization. I have presented our answers in an attachment to this letter.

I trust they will be of some help in your consideration for the very important topic of civil space remote sensing in the U.S.A.

Yours sincerely,

A.C. Wiin-Nielsen

(A.C. Wiin-Nielsen)
Secretary-General

Mr. Harold L. Volkmer
Chairman, Sub-Committee on Space Science
and Applications
U.S. House of Representatives
Committee on Science and Technology
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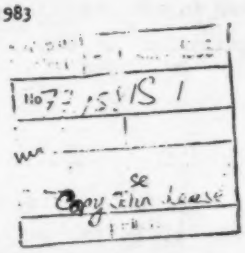
July 25, 1983



Dr. Aksel C. Wiin-Nielsen
Secretary General
World Meteorological Organization
Harkeskelsvej 17
3210 Vejby
DENMARK

Dear Dr. Winn-Nielsen:

Thank you very much for your most helpful testimony at our hearings on civil space remote sensing. You were very kind to make such a long trip in order to appear before our Subcommittees.

Several witnesses have supported the position you presented--that the free international exchange of weather data benefits everyone--although no one could have the perspective which you bring. In other words it was very helpful to hear directly from the World Meteorological Organization.

I do have a set of questions regarding a dialogue that occurred during the hearing. This had to do with the idea of an international meteorological satellite system and how such a system might be funded.

Briefly, how are WMO activities funded now? What fraction do the U.S. and other nations pay? Are special activities funded differently than continuing activities? What fraction of the present total global metsat activity does the U.S. support? If there were an internationally-funded global system, and if the funding support were apportioned according to each nation's use of data generated, then what fraction of the total cost do you think the U.S. might be asked to support? Why? Finally, would you please give these estimates in terms of both fractions of the total and also in terms of actual funds (dollars if convenient)? If general answers are vague or hard to explain, you might want to answer in terms of representative examples or, for prospective situations, reasonable scenarios.

Let me thank you again on behalf of Chairman Scheuer and myself for your very helpful testimony. We look forward to your answers.

Sincerely,

Harold L. Volkmer

HAROLD L. VOLKMER
Chairman, Subcommittee on
Space Science and Applications

1) HOW ARE WMO ACTIVITIES FUNDED NOW?

Funding is done through a regular budget and several special and trust funds. I shall restrict my reply to the regular budget and describe some special funds in your third question. Article 24 of the WMO Convention states "The expenditures of the Organization shall be apportioned among the Members of the Organization in the proportions determined by (WMO) Congress."

2) WHAT FRACTION DO THE U.S. AND OTHER NATIONS PAY?

The WMO Congress sets a scale of assessments for each four-year financial period. The WMO, as a specialized agency of the United Nations determines its assessments in close co-ordination with the United Nations to assure a high degree of uniformity with respect to these operations in the UN system. The proportional contributions to the WMO for the eighth financial period (1980-1983) was the following:

USA	24.5 %
USSR	10.4
United Kingdom	5.7
Fed. Rep. of Germany	4.9
France	4.9
China	3.9
Canada	2.7
Japan	2.6
Italy	2.2
India	1.9
Australia	1.8
All others	34.5

3) ARE SPECIAL ACTIVITIES FUNDED DIFFERENTLY THAN CONTINUING ACTIVITIES?

Yes, the WMO administers several special and trust funds. The main sources of funding of these extra-budgetary activities are the Voluntary Co-operation Fund, the Agrometeorological Programme in the Sahel region of Africa, and technical co-operation projects financed by various donor Members.

The WMO Secretariat also carries out the financial administration of that part of the United Nations Development Programme assigned to WMO.

4) WHAT FRACTION OF THE PRESENT TOTAL GLOBAL METSAT ACTIVITY DOES THE U.S. SUPPORT?

The WMO does not have any information about the funds used for the present total global metsat activity. However, we can consider that the present metsat activity consists mainly of the following satellite systems:

Geostationary satellite	Location	Operator
METEOSAT	0°	European Space Agency
GMS	135°E	Japan
GOES-West	135°W	USA
GOES-East	70°W	USA
Polar orbiting satellites		
METEOR-2		USSR
NOAA-7 and NOAA-8		USA

We can add in other planned satellites such as the INSAT by India and the Geostationary Operational Meteorological Satellite by the USSR, plus the satellite read-out facilities operated by many other countries.

If we assume that the description above constitutes the present total global metsat activity, I would estimate the USA supports about 50% of it.

5) IF THERE WERE AN INTERNATIONALLY-FUNDED GLOBAL SYSTEM AND IF THE FUNDING SUPPORT WERE APPORTIONED ACCORDING TO EACH NATION'S USE OF DATA GENERATED, THEN WHAT FRACTION OF THE TOTAL COST DO YOU THINK THE U.S. MIGHT BE ASKED TO SUPPORT?

One might assume that the apportionment in this problem would look similar to the proportional contributions assessed on the WMO Members for contributions to the regular budget. In such a case the U.S.A. might be asked to support about 25% of the total cost. I would think that it would be extremely difficult to reduce the U.S.A. contribution to such a small fraction. Some of the Members have great difficulty meeting their assessed contribution to the regular WMO budget. I estimate the total annual cost of an internationally-funded global satellite system would be at least 10 times larger than the regular annual budget of the WMO. It therefore appears too optimistic to expect that all of the 152 Members of WMO would or could be proportional contributors to an internationally-funded global system.

Another scenario might be that the 11 WMO Members listed in the answer to question 2) above, are proportional contributors to an internationally-funded global system in the same ratio as their proportional contribution to the WMO. On such a scenario the USA would pay about 37% of the total cost.

In order to provide estimates for this question in dollars as you requested I shall construct the following scenario:

(i) The international global Metsat system consists of a total of seven satellites in either a geosynchronous or polar orbit;

(ii) Total costs for the system will average $40 million for each year of useful life from each of the seven satellites.

This converts to an annual budget of $280 million per year for the global system.

U.S.A. contributions to this system would be dependent on the membership and their proportional contribution:

A. Members are those who operate satellites today and U.S.A. contributes 50% or about $140 million dollars per year.

B. Members are the 11 listed in the answer to question 2) above and U.S.A. contributes about 37% or about $105 million per year.

C. Members are all the 152 Members of the WMO and U.S.A. contributes about 25% or about $70 million per year.

I think these three scenarios indicate the relative economic merits of considering some form of international co-operation for a global meteorological satellite system. However, the cost of such a system is very dependent on its design. Therefore, my dollar figures could vary over a wide range depending on the actual system design.

Mr. VOLKMER. At this time we will proceed to our second witness, Mr. Richard A. Frank, former Administrator of NOAA.

And Mr. Frank, your statement too will be made a part of the record. I appreciate your furnishing it to the committee. You may either review the statement in full or you summarize it, however you which to proceed.

STATEMENT OF RICHARD A. FRANK, WALD, HARKRADER, & ROSS AND FORMER ADMIMISTRATOR OF NOAA, WASHINGTON, D.C.

Mr. FRANK. I would like to summarize it if I may, Mr. Chairman.

Mr. VOLKMER. Go right ahead.

Mr. FRANK. Chairman Volkmer, Chairman Scheuer, member of the committee.

It is a great pleasure to testify before you this morning on the subject of the possibility of transferring the satellites. I have the opportunity in the past as Administrator of NOAA to testify before this committee on a variety of science and technology issues, and to deal with members of the committee individually on those issues.

I have always enjoyed doing that in the past and found it very constructive. I look forward again to doing it on this subject.

I am presently a partner in the law firm of Wald, Harkrader & Ross. However, the views I express this morning are solely mine. They do not necessarily reflect the views of my law firm or of any of its clients.

I speak rather as a former Administrator of NOAA and an individual who had the opportunity during 1979 and 1980 to review these subjects in an interagency committee during the Carter administration.

I would like to address the subject first of weather satellites first if I may, because my views on weather satellites are different from my views on land remote-sensing satellites.

With respect to weather satellites, I believe it would be unwise to transfer them to the private sector. First provision of weather services in this country as well as other countries is thought to be a public function. It is a public function that involves safety and national security.

An essential component of that public function is the products of weather satellites. Under these circumstances, it seems to me that at least presumption should be made that the Government should provide the service and have control over its essential components. I think transferring to the private sector the entire satellite system would not retain the degree of control that is necessary.

It is true that there is a private and commercial market for some meteorological satellite products. That market is not insignificant, but it is certainly not as significant as the public function that I have mentioned before.

Even though this is a public function, I suppose one could argue that if the Government were doing a poor job in R&D, operation of the satellites and dissemination of products, that the private sector ought to be given the responsibility.

As a former Administrator of NOAA, I can tell you at least in my view, that this is one of the areas in the Government where the

entity which is operating has a management responsibility, is doing an excellent job.

When I entered Government I found some parts of my own organization, many parts of other entities in the Government, doing their jobs only adequately, or indeed not well at all. But with respect to the National Environmental Satellite Service, NESS, that component of NOAA responsible for running the satellites, it was doing an extremely competent job. It was lean, it was innovative, it was efficient.

Its assistant administrator, David Johnson, was one of the most competent civil servants I have ever met. And he assembled around him a large group of extremely capable technical personnel. Indeed, I think if this satellite system were transferred to the private sector, the private sector would do little but hire the individuals who would leave the Government from NESS, and they would be operating the system in the private sector.

In sum, I believe that the Government is doing an excellent job of operating the satellites, the weather satellites.

I do have an impression, I admit it is a subjective and a complex calculation, but I do have the impression that if weather satellites were given to a private entity, because of the fact that it would have proprietary rights and a monopoly, in the end the Government would be paying more for the products it now uses than it does now. I cannot substantiate that with calculations. I think it would be a very complex exercise. My instinct, however, is that that is true.

One of the principal reasons for transferring the weather satellites to the private sector has been to provide a subsidy for the transfer of apparently not economically, viable, land remote-sensing satellites. I do not believe, if a subsidy is needed, that the subsidy ought to be a subsidy in the form of a transfer of function. Rather I think that the subsidy ought to be visible. It ought to be line item in the budget. It ought to be clearly identifiable.

I believe this administration and indeed prior administrations have argued for that. We shouldn't have hidden subsidies. Having this be the subsidy would simply make the issue far more complex than it should be.

My views with respect to land remote-sensing satellites are different. While I believe the evidence before these subcommittees would not now lead to the conclusion that land remote-sensing satellites should be transferred to the private sector, I reserve my judgment as to whether they should be or whether at least part of the system should be.

We engaged in a study in 1979 and 1980 specifically on this subject—should there be transfer to the private sector. You have the results by virtue of having that study.

I would like to give you some personal views on the subject, however, and also what I believe to be the consensus of the individuals who worked on that study.

One consensus was that the Government operates the system competently for the same reasons I mentioned before with respect to weather satellites. There is one exception to that, however. It's admittedly a significant exception to the extent that there is a pri-

vate market. And that is that the Government does not do marketing well.

Government employees are not hired because they know how to market. They are not used to marketing. And they don't have proper incentives to market. The incentive to save money is not enough of an incentive. The profit motive does not exist.

In sum, I think that the Government markets poorly. And to the extent we are talking about marketing in the private sector, it should not be the Government which does it.

I add to that by the way that OMB simply won't fund market development. So even if we had a group of very capable individuals for one reason or another, the money would not be there in the budget.

During 1979 and 1980 we analyzed whether there was an additional commercial market available to make land remote-sensing satellites economically viable. We concluded then, and I think unequivocably, that that market did not exist.

Now that judgment may not be any longer valid because you have additional information before you, and you are collecting even more information than that. However, our judgment at that point was that there was not a large additional market out there that would make this successful economically.

We concluded then, as I believe anyone would conclude now, that for a private venture to want to operate a satellite system, it would have to have proprietary rights over the products. Furthermore, we might end up with a monopoly. That is, we might end up with only one entity operating the system or having only one system.

We assumed that there would have to be a regulatory system operated by the Government to assure in fact that this monopoly, the one who had the proprietary rights, would not abuse those rights. Establishing a regulatory system, of course, costs money, and that cost should be included in the calculation of the cost of transferring to the private sector.

One other conclusion we reached is that R&D probably would not be done adequately by any private entity which had control of the system. In other words, we felt that NASA would end up saddled again with the responsibility for R&D.

There were other instances, for example, with respect to communication satellites, where private entities took over the responsibility, but simply because of the large cost, or because of their own internal calculations as to what was best for their company, they did not do basic R&D. That basic R&D if it is going to stay with the Government costs money. And that cost also ought to be included in any calculation.

With respect to the comments I have made by the way—with respect to meteorological satellites, for example—I don't mean to suggest that products should not be charged for by the U.S. Government. For example, the meteorological satellites. This has been alluded to by Congressman Lujan and also Congressman Brown. I do not mean to suggest that the international community should not share the cost of operating this system, meteorological system, for example, or that those in the private sector who use the products of the meteorological system should not pay for it.

Television forecasters translate weather service forecasts and other information, and also the pictures from the satellites into dramatic form for presentation over television. A large number of individuals provide specialized weather services for users who need those specialized services, it being assumed, I guess, that those specialized uses aren't sufficiently a public function to be performed by the Government. Whether or not one agrees with that, I think we ought to charge more internationally and domestically for the services we provide with respect to the satellites.

Turning back now to the land remote-sensing satellites, I do not have a judgment whether they should be transferred to the private in whole or in part. I do have some general comments on how we are proceeding, however.

Congressman Scheuer made a wise statement when he said there are other issues in the issue of transfer. It seems to the first issue, and indeed the principal issue, is not whether we should transfer to the private sector, but how important the data is to us, and how important it is for us to have a United States system.

One could conclude that the data is important, but that we could get the data from other countries. If France, Japan, and others are going to put up subsidized systems, if we can get that information on a reliable basis, if it will not be too expensive, why not take advantage of their willingness to put up systems and subsidize them. We would have to examine how reliable they are.

But the primary issue before that is how important is this data to us? If we were shut off from the data for a half year, how bad would it be? I might add that if we made the judgment that the data was pretty important to us, but on the other hand we could rely on other systems, if we did rely on other systems, and if we proved to be wrong, that is they were not reliable, it would not take very long for the United States to have its own system back up in the air.

That is, if we were to abdicate our leadership in the area of commercial remote sensing, we are certainly not abdicating our responsibilities or our lead in remote sensing generally. The United States has rather substantial capabilities which are not commercial in this area, and which are used for other purposes. It would not take long, I believe, for us to put up a satellite system if we found that using other satellite systems did not turn out to be the wisest course of action.

And I reiterate, we would have to know what the products of the satellites are, and whether we could rely on other countries to provide those products to us.

I suppose I would be concerned if our default in this area were something other than an isolated default. That is, if I were doing this, I would go ahead with the satellite system. But I could see someone else saying that it is not a high enough priority, and in this specific instance, we should not have a commercial satellite system.

I would be disappointed, however, if that were Government policy across the board, and that we were not taking technological risks in the commercial area, if we stopped spending money in other areas for R&D.

My second general point is that if we are going to have a satellite system, a land remote-sensing satellite system, whether private or public, we ought to have a good one. I consider the present situation the worst of all possible worlds. Basically OMB is starving the satellite system. We do not have reliable continuity of data. Other systems will pass us. We will end up spending money, and it will be a bad economic venture because we will get back less than we otherwise would. And in fact our own Government might start purchasing information from other systems, if for example, our satellites go out.

So if we are going to have a satellite, let's have one. And if we are not going to have a satellite, let's stop the program altogether.

Finally, if we believe we should have our own system, I think we ought to look seriously at the alternative, not of turning over the entire system to the private sector, but in turning over that portion of the system which the private sector does best. I believe the Government will ultimately do the R&D anyway. I believe the Government runs satellites and manages them and operates them well. I would leave those responsibilities in Government hands at present, and I would auction off or license or contract out the right to serve the commercial market.

In other words, the Government would operate the satellite and serve itself. And a commercial entity, or conceivably commercial entities, would have the right or license to sell the data commercially. They might have a proprietary right. I think that they would insist on that. But that would not concern me; that is, giving the proprietary right to one entity, or to a group of entities to serve the market.

Think of it this way. If we adopted this proposal and no one bid on the right to serve the commercial market, that would give this committee and the executive branch some indication that companies don't believe there really is a commercial market out there. And it might lead one to conclude that where the money really is going to made from operating these satellites, is serving the Governmental market.

And what the operator of the satellite system really will do is simply charge the Government a lot or more than it pays now, and make its profits in that fashion. I do not believe that would be a wise choice for the U.S. Government as a purchaser.

Chairman Volkmer, Chairman Scheuer, members of the subcommittee, that's the end of my statement. I would be happy to answer any questions you have.

Again, let me reiterate the pleasure in being before you to discuss what I consider to be a very important subject for the United States.

[The prepared statement of Mr. Frank follows:]

STATEMENT OF
RICHARD A. FRANK
CONCERNING LAND REMOTE SENSING AND WEATHER SATELLITES
BEFORE THE
SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE
RESEARCH AND ENVIRONMENT
AND THE
SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS
OF THE
COMMITTEE ON SCIENCE AND TECHNOLOGY

UNITED STATES HOUSE OF REPRESENTATIVES

July 21, 1983

Chairman Scheuer, Chairman Volkmer, Members of the Subcommittees,

I am pleased and honored to be asked to testify before the Subcommittees concerning the Administration's proposal for transferring NOAA's land remote sensing and weather satellites to the private sector.

I am presently a partner in the Washington, D.C. law firm Wald, Harkrader & Ross; however, the views I present today are mine and do not necessarily reflect the views of my law firm or any of its clients.

I was Administrator of NOAA between 1977 and 1981 and, in that capacity, had supervisory responsibility over the National Environmental Satellite Service, the NOAA component responsible for satellite operations. During that period the Executive branch analyzed some of the issues before you today, including whether land remote sensing satellites should be transferred to the private sector. My perspective, therefore, is as a former NOAA Administrator responsible for satellite operations and as a former government official who considered commercialization of the satellites.

With respect to weather satellites, I believe transfer to the private sector is unwise. Indeed, the case thus far made for transferring weather satellites is sufficiently weak that this subject does not warrant further substantial study. This view is based on the following factors.

First, in this country as well as others, providing weather services is inherently a public function and

responsibility involving public safety and national security. Meteorological data from satellites is an essential component of that function. In these circumstances, at least a presumption exists that the government rather than the private sector should control the service. To transfer the weather satellite system as has been proposed would lead to loss of that control. To be sure, weather satellite products do have private sector markets served commercially e.g., those who need specialized weather services not thought to be adequately a public function to be offered by the Weather Service. These markets are not insignificant but certainly are less significant than the governments weather forecasting responsibility.

Second, even though weather satellites principally serve the public at large through the government, an argument could be made for their transfer, in whole or in part, to the private sector, if the federal government were doing a poor job, or a less capable job than the private sector could or would do in providing this service. The contrary is true. I was impressed by the technical competence and devotion of employees of the National Environmental Satellite Service. NESS was then, and no doubt is now, one of the finest government organizations. It was lean, competent, innovative and efficient. I have seen no convincing evidence the private sector would do a better job.

Third, I have no reason to believe that the private sector could provide weather satellite services and products to the federal government (or, for that matter, to other markets) at an overall cost less than the present cost to the government. Any cost analysis is complex, and this judgment is subjective. I speculate, however, that if the weather satellites are transferred to the private sector, particularly an entity that would have a monopoly, the government would pay more for its products then it does now.

Fourth, the principal argument thus far articulated for transferring weather satellites to the private appears to be to provide a subsidy for the transfer of land remote sensing satellites. The government apparently believes, and I concur, that the economies of scale (e.g. multiple use vehicles) resulting from the combination of the two systems are not sufficient to justify keeping the systems together just so they are together. Whether or not land remote sensing satellites are transferred to the private sector, weather satellites should not be transferred. If Congress determines that this country should develop and operate a land remote sensing satellite system, that it should be transferred to the private sector, and that a subsidy is necessary and justified, then the subsidy should be direct and visible, involving a dollar amount that shows up in the budget, rather than through a transfer of a separate function, like weather satellites.

My views with respect to land remote sensing satellites are different. The evidence before the Subcommittees would not now lead one to conclude that land remote sensing satellites should be transferred to the private sector. Nonetheless, various features of land remote sensing satellites are sufficiently different from weather satellites to make transfer to the private sector an option worth considering.

As noted earlier, during the 1979-1980 period, an interagency group analyzed the land remote sensing program and examined, inter alia, whether that program should be transfered to the private sector. I would like to summarize certain understandings we reached even though these should, in light of possible availability of further information, be treated as tentative.

-- The concensus was that the government was competent to develop, own, and operate the land remote sensing satellite system. I do not recall any suggestion that NESS could not manage the system efficiently and effectively and as well as, if not better than, the private sector.

-- The one, admittedly significant, exception to the above comment is that the government generally, and the Department of Commerce and NOAA and NESS in connection with land remote sensing satellites, do a poor job of commercial marketing. Government officials are not used to developing markets, generally are not retained because of their competence

to do so, are not enough motivated by profit or cost savings to want to do so, and have rarely shown themselves capable of doing so. Further, OMB is invariably unwilling to fund market development. If developing markets is a significant part of any program, at least the market development function of the program should be run by the private sector.

-- Certain other government constraints, in particular civil service rules, make operating a government program of this nature less efficient to a certain extent. To the extent operation of a program, or parts of the program, can be exempted from certain civil service regulations, the program probably can be operated more expeditiously and at less expense. (Obviously, those civil service rules leading to inefficiency have compensating social benefits; I do not propose here to balance the inefficiency against the benefits.)

-- During the 1979-1980 period, we were unable to conclude that a sizeable additional market existed for land remote sensing products. Consequently, the government appeared to be likely to be the predominant purchaser of land remote sensing products. That judgment may or may not still be valid.

-- It was assumed, and I believe it is still assumed, that any transfer of land remote sensing satellites to the private sector would require that the system owner have proprietary rights to the products. Further, the owner

would probably have a monopoly. Many of us were concerned that the situation would inevitably lead to high costs for the products, both to the government and to other purchasers, some of whom, like researchers and academia, serve the public interest in making use of those products. Any transfer of the system to the private sector would therefore be accompanied by a regulatory system to try to assure, inter alia, that the owner of the monopoly did not abuse its privileged position, that the government received the products it needed, that sale of products to the private sector market was proper, e.g., nondiscriminatory, and that our international obligations and foreign policy needs were satisfied. Establishing and operating that regulatory system entails an expense, and that expense should be included as a cost in the transfer of the satellites to the private sector.

-- Many of us were concerned that the private sector operator, even if it operated the system efficiently, developed the market well, and sold the products to the government and others in an acceptable fashion, would not be willing to invest in additional research and development. The profitability of the operation was tenuous at best. Under such circumstances, any corporation might decide - from its narrow profit perspective, the right decision -- not to allocate funds and effort to R&D. The United States would

suffer from this short-sighted perspective. We concluded that NASA might still be saddled with R&D responsibility. Such costs should be included in the calculation of any transfer to the private sector.

I reiterate that I do not now have a judgment whether or not land remote sensing satellites should be transferred to the private sector. As Secretary of Commerce Baldrige testified, we should reserve judgment until the views of those who might be interested in operating a system and others who have an interest in the systems product are heard from. I do however have three general comments about the fashion in which we are proceeding.

First, the principal issue on which Congress and the Executive branch should focus is whether, and to what extent, it is in the interest of the United States to have a United States land remote sensing satellite system. Owning such a system may not be high priority for this country if it can reliably obtain, at reasonable price, products from other countries, like France or Japan, which intend to develop and operate subsidized systems. The United States may benefit from purchasing their products rather than investing in and subsidizing its own system. I do not believe it would be a clearly unwise decision for the United States to abdicate its leadership in the commercial

land remote sensing field. However, I would be concerned if our default was not an isolated decision but was also applied to a variety of other commercial applications of high technology.

Second, if we decide this country should have a remote sensing satellite system, then I suggest we have a good one. We should not proceed in our present half-hearted fashion. If the private sector should operate the system, then let it do so and let the government be prepared to subsidize it. If the government should operate the system, then let OMB recommend adequate funding and let Congress authorize and approve such funding. The present situation in which OMB is slowly starving the remote sensing satellite effort and making continuity of data unreliable is the unwisest of all possible worlds. It will result in the expenditure of substantial funds but not enough; it will allow other countries to surpass us with better systems, with the result that our system will be of marginal value. If we are to proceed, we should make a commitment to continuity of quality data.

Third, if the United States needs its own system, we should look seriously at the alternative of letting the private sector do what it does best, and of transfering only part of the function or system. If the government can perform R&D and operate the satellites well, perhaps it

should do so and provide products to itself, thus maintaining the control it needs. That does not mean the private sector could not be sold the right to develop and sell to private markets. This might be achieved by entering into a long-term, exclusive contract with a private sector entity in which it would have proprietary rights to all products and rights to all sales, except sales to the government. That contract right might be auctioned.

Chairman Scheuer and Chairman Volkmer, Members of the Subcommittees, that concludes my prepared testimony. I would be happy to answer any questions you have.

Thank you.

Mr. VOLKMER. The Chair now recognizes the gentleman from New York, Mr. Scheuer.

Mr. SCHEUER. Thank you, Mr. Chairman.

We very much appreciate your very excellent testimony, Mr. Frank.

It's been stated in these hearings on other days that the policies of the current administration are simply a continuation of the policies of the Carter administration.

Is this a correct statement in your view?

Mr. FRANK. I think not. At least in part.

As I understand the policies of this administration or at least as it has been stated by this administration, it is its intent in the near future to turn over these satellites to the private sector. And I get the impression that it is the intent to turn over the weather satellites—or was the intent to turn over the weather satellites as well as the land remote-sensing satellites.

The policy of the Carter administration was not to turn over the weather satellites, period. The policy of the Carter administration was, if possible, at some future time to turn over the land remote-sensing satellites.

It was clear when we did our study, however, that now was not the right time, that there wasn't a commercial market, that it wouldn't work. If at some time there was a commercial market, and we had the right entity to operate the land remote-sensing satellites, then that would be fine, and we should work toward that objective.

But a decision would have to be made again in the future as to whether or not we would turn over the land remote-sensing satellites.

Mr. SCHEUER. So it was never really the policy of the Carter administration to commercialize, "as soon as possible"?

Mr. FRANK. It was the policy to work toward that objective. It was the feeling of those who embarked on the study, I believe

unanimously, although I really can't speak for others, that it would be quite some time before this could be seen as a commercial venture where a private entity would be able to take over the satellites without a substantial subsidy.

Mr. SCHEUER. Has anything changed in that regard?

Mr. FRANK. Nothing has changed, at least in my view, from the information I have seen submitted to this committee.

Now it may be that as a result of Government requests for views from industry, other information would come in which could change someone's view.

Mr. SCHEUER. Of course, we are looking very eagerly to the results of their RFP, their request for proposals.

How many Landsat-D type satellites did you plan to fly?

Mr. FRANK. Do you mean at one time, Mr. Chairman? Do you mean vertically or horizontally?

Mr. SCHEUER. In sequence. How many total?

Mr. FRANK. Well I think at one time we were planning to go out to D triple prime. But basically the answer was that we were obligated to continuity of data, and would have gone out as far as we had to to have continuity of data—reliable continuity.

Mr. SCHEUER. Weather satellites?

Mr. FRANK. Weather satellites we were obligated also to continuity, which meant two geostationary and two polar orbiters.

Mr. SCHEUER. If you had to sum it up, what's the relationship between the Carter policies and the Reagan policies on these matters?

Mr. FRANK. Well, I am the wrong one to speak for the Reagan policies. But if the Reagan policy is to transfer weather, either because that's a wise thing to do on its own merits, or because that subsidy is a logical subsidy for the transfer land remote-sensing satellites, then the Reagan administration policy is different from the policy of administrations before it.

If the Reagan administration policy is to transfer land remote-sensing satellites without regard to cost considerations because of a general feeling that these satellites ought to go to the private sector, then it is also different.

I don't read Secretary Baldrige's statement that way though, at least with respect to land remote-sensing satellites. It seems to me that the Secretary modified somewhat an earlier position, and is taking the position now that we should wait and see what the information shows.

If he is taking that position on land remote sensing, then I think the two administrations have a position which is not too far apart.

Mr. SCHEUER. He did take the position with us when he testified here that we would never really know what the free market forces were telling us or would tell us until he went out with an RFP.

I always thought it was a little bit unfair to ask the free enterprise community to invest hundreds of thousands of dollars or perhaps millions of dollars to respond to an RFP without knowing what Congress was prepared to do. But I suppose that is neither here nor there.

At any rate, I thank you very much your splendid testimony.

Thank you, Mr. Chairman.

Mr. VOLKMER. All right.

Mr. Brown.
Mr. BROWN. I have no questions at this time.
Mr. VOLKMER. All right.
Mr. Andrews.
Mr. ANDREWS. I have no questions at this time.
Mr. VOLKMER. All right.
Mr. Lujan.
Mr. LUJAN. Thank you, Mr. Chairman.

Mr. Frank, I agree with you that the R&D portion of it will always remain with the Government. That that's our traditional way to do it, and that it should be done that way.

After all we do it that way with aeronautics. We do it with materials development. So it is not an unusual policy for Government to continue the R&D.

You say that in the Landsat requirement that perhaps the dissemination of information could, if we separate the various functions, that perhaps that might work, but not turning the entire system over to some private company. And I think you are right on target on that.

My question is what is different with Landsat that you could not just take the information dissemination portion of the weather satellite as you proposed with Landsat? Why does it make it any different? Why couldn't we disseminate the information or sell information? Now let me back up.

Why could we not privatize that portion of the program, the dissemination of information, in both the Landsat as you proposed, and the Metsat?

Mr. FRANK. I think we could. And I would not object to that, with one caveat.

And that caveat is that even though the specialized weather services which are distributed are not thought to be adequately a public function to be done by the Government, they clearly are pretty important to this country for a variety of reasons. For example, provision of meteorological information in the oceans, and with respect to crops and the like.

One could argue that there is a public interest in seeing that that information gets to the public at a relatively low cost so that it can be used. That is, one could argue that it is better that the information get to the farmer in Florida at a low cost so that he will use it, rather than at a high cost so that he will be not inclined to use it. Because if he uses it, apparently the crop will be bigger. The size of the pie will be better and bigger.

Mr. LUJAN. But that would apply to the information from Landsat also.

Mr. FRANK. That's true. But I think that information from Landsat, first of all, is more related to commercial enterprise, and apparently will be provided by another system.

That is, let's say that we took away our Landsat information from individuals. Apparently we will have a French and a Japanese system which will provide it.

If we took away our meteorological information from the farmers in Florida, they wouldn't have it. I don't think they could get it from other systems.

Now I am obviously taking an extreme. You are not talking about taking it away from them. You are talking about charging them.

But basically I do agree with you. I think we can charge for that information. Right now we do not charge forecasters, if that's what you want to call them, on television for the picture from the satellite. I am not sure what kind of a public function those forecasters perform. I think in 30 seconds on television one could tell the public what the weather is going to be and it would be most important to tell them if there were a serious problem like a tornado.

In fact that's not what is done. In fact what is done is a dramatization of the whole enterprise. And the meteorologists on television do a lot more than provide information. We don't charge, or the Government doesn't charge those individuals for the picture from the satellite. We don't charge the individuals who provide specialized weather forecasts for any information. And I think we could.

Mr. LUJAN. So what you are saying basically is the same idea that I had, that we would look at the system, divide it up into its subparts, and see which ones of those subparts might be good candidates for privatization?

Mr. FRANK. Yes, sir.

And I believe we might look at the experience in other countries. My impression is that in some, if not many other countries, they charge, either the government charges or private parties charge, and usually it is the government in other countries, they charge for specialized weather services.

Mr. LUJAN. It seems to me like had, let's say the telephone for example, been developed by the Government, that we would have had those same arguments that we should not turn it over to private enterprise because of the international implications, because there might be an emergency and you don't want to deprive some person of calling the doctor because of the bumbling of some private company that could not make the proper connection.

We have seen within the telephone system that the private system has been able to develop a competent system. And I am wondering why we are so afraid of the private system not continuing, as a matter of fact, because I agree we have done a good job. Sometimes you wonder if the weather would improve if the private system ran it instead of the Government. [General laughter.]

But I think that it's a good system that we have for the dissemination of information. And I am bothered by the fact that we seem to believe that only the Government can do that.

Mr. FRANK. I think situations are not analogous, Mr. Congressman, if I may respectfully suggest.

In the case of telephones, the primary user is not the Government. The primary user is the individual or what we would call the private sector, either commercial concerns or individuals. That by and large is not going to be true with respect to weather satellites, for example.

Second, it is also true that the Government does have its own telephone systems in effect. That is, we have not been prepared to turn over to the private sector, not only the making of the telephones but the operation of a telephone system. The military, for

example, and other entities of the U.S. Government have their own——

Mr. LUJAN. I think that we should keep the military uses within Government.

That's a good—that's an option. That's a viable option.

Mr. FRANK. Well in order to keep the military uses, which would mean putting up a military or additional military satellites presumably, and if we are talking about intelligence uses it might mean putting up additional land remote-sensing satellites for the intelligence community which we would control and have control over, just the way we have control over the telephone systems.

That would be very expensive. That is, that would be making two systems instead of one.

It is always true that part of what Government does is provided by the private sector. Obviously, having an army is a public function. But the army doesn't make its own shoes. It doesn't make its own weapons. On the other hand, it doesn't have the private sector takeover, own and operated bases. It wants control over that. It wants control over its forces.

Where there is a competitive market, for example in the sale of shoes, the army will buy shoes from the private sector, and should.

It would not be a competitive market in this satellite system because we are basically talking about one satellite system.

And I think that the situation just is entirely different. I think the telephones are like shoes, and that satellites, because there would be one system, are quite different.

By the way, satellites may be getting to be more like shoes or telephones if we for a moment say that we will have our system, but also the Government might buy from the French or the Japanese. That is, let there be a private U.S. system, but let the Government then buy from the Japanese, the French or the U.S. system, whoever bids lowest.

My judgment is that no U.S. company will take over the U.S. system unless it has a captive governmental purchaser.

Mr. LUJAN. No, no; we could buy the weather information. It's the surveillance sort of satellite that the military operates opposite from—as distinct from NASA.

That surveillance information, you know what's going on around the world and troop movements or whatever may be, that I don't think is very logical to go and buy from the Japanese or the French, or for certainly not the Russians.

So we could have our own surveillance system, but purchase the weather information. The weather—everybody's going to have that information anyway.

Mr. FRANK. Well, again I think there is a difference between telephones and shoes where there are many makers of telephones and shoes, and between a satellite where you would have one company presumably having a monopoly and proprietary information.

Traditionally governments have not built shoes. I think traditionally governments have operated satellites. We happen to be operating satellites well. I think we would probably make shoes poorly.

Mr. LUJAN. What would probably happen if it started out by the Government having it, is NASA would say we've got to have own

system because we've got to keep in constant contact with Cape Canaveral. We have got to have the instant access to Johnson and to all our other things. And so therefore it might not be a good idea because we are going to have to have our own system.

I think it is analogous in many ways. We are in Government like a mother not wanting to let go of her child. And so Government agencies tend to say, well, no, no, this is our program. And so therefore we ought to keep it right here. That bothers me some.

But anyway to put it on a positive note, perhaps breaking down the subsystems and those subsystems that make sense goes commercial, and then the ones that don't make sense don't go.

Mr. VOLKMER. The gentleman from——

I would like to interject at this time that according to the statements that we have had from Secretary Baldrige, they do not plan to commercialize the National Weather Service. That that would still remain a governmental function.

Now considering that, do you wish to change any part of the commercialization features of the weather satellites, the data?

Mr. FRANK. The question, Mr. Chairman, was asked whether there was a difference between the policy of the two administrations.

As I understand it the Reagan administration is considering, or indeed may have, the objective of commercializing weather satellites.

The Carter administration did not contemplate doing that at all.

So there is that difference.

Mr. VOLKMER. In other words—but to get back to Mr. Lujan's question about, you know, whether you could transfer to the commercial sector data from the weather satellites just as you can data from the land sensing satellites.

What do you—at least your answer led me to believe that you thought you could do one as well as the other?

Mr. FRANK. That is correct.

Mr. VOLKMER. Even with the Government continuation of the National Weather Service?

Mr. FRANK. That is correct.

Mr. VOLKMER. In other words the Government would have to buy the data from somebody else?

Mr. FRANK. No. If I were a governmental entity or a private entity, and I had some satellites, and I needed the products from those satellites, I would not give them to someone else and then buy the products back.

Mr. VOLKMER. Well there is a difference with Landsat then? Or are you saying the same thing about Landsat?

Are you saying that we cannot spin off the data from Landsat?

Mr. FRANK. I am saying we can spin off the data from either. But I would spin off only the sale of the data commercially. I would not spin off the sale of the data back to the Government.

Mr. VOLKMER. OK. I understand you now.

I understand what you are saying is that on the weather satellites you could have additional method of commercialization, but not the public sector for the National Weather Service?

Mr. FRANK. That's correct.

Mr. VOLKMER. And if there was, whether it is aeronautical for the airlines or whether it's for crops or whatever it was, those things could possibly be spinoffs?

Mr. FRANK. That's correct.

Mr. VOLKMER. Special services from weather data?

Mr. FRANK. That is correct.

Mr. VOLKMER. All right.

Mr. FRANK. I might say in the meteorological area I don't know what the cost and benefit analysis would show.

As the Director General of the WMO has said, we would have to, if we were for example going to sell this information internationally, we would want to find what we were going to have to pay internationally.

On that subject, by the way, I think that respect to bilateral relations we give far more meteorological information to any individual country than it gives back to us.

And so that we would come out probably with a net gain financially.

Mr. VOLKMER. Now a previous witness—and I can't remember the person's name—at that time at one of our hearings, proposed that on the Landsat, that we could possibly continue to operate the satellites and then obtaining the raw data and selling off the raw data. We would do it on a bid basis. Say on 6 months at a time. And that whoever bid the highest for that raw data would then have the right to price that raw data to any buyer for it for that 6 months.

And then at the end of that 6 months you would have another process. And whoever was the highest bidder would then be able to price it. This in an attempt to determine what the actual value of it is, and where it could be used in the private sector.

Do you wish to make any comment? I don't know if you have heard about that or not. Do you wish to make any comment about that possibility?

Mr. FRANK. That is not so unlike the suggestion I had made that you would lop off from the system the marketing function.

I am inclined to believe that doing it on a 6-month basis may not be the best way to do it because you will want a private company to make substantial investment in the value-added operation, and also in the developments of markets. And I wonder whether a company will be prepared to do that if it only has the information for 6 months.

I'd be inclined to think a longer term contract would be sensible. But I think that that's not a bad idea. It doesn't jeopardize control over the system. It allows the Federal Government to do what it does best. It takes away from the Federal Government that which it does worst.

And it might work out—in the end would probably result in more use of the data. And the Government spending less money in the sense that the Government from this sale would get something back, whether it is a percentage of the gross, a percentage of the net, or a flat fee. It would get something back from the commercial sale.

Mr. VOLKMER. The other—the last question I have—we have a problem right now as far as we've got Landsat up and Landsat-D prime is the only one left.

In the event that we would go with something like spinning off only the data and could maintain the satellites, how long would it take us to get another satellite ready to go up, double prime?

Mr. FRANK. I am sorry, Mr. Chairman. I simply am not now as conversant with the technological answer to that that I used to be. That is I would have known the answer to that as Administrator of NOAA. I don't know it now.

Mr. VOLKMER. The gentleman from Florida, Mr. MacKay, have any questions?

Mr. MACKAY. Your written testimony contains one comment that I would like to pursue simply because my intuition would have been different.

And the comment is, the Government apparently believes and I concur, that the economies of scale, that is, multiple use vehicles resulting from the combination of the two systems are not sufficient to justify keeping the systems together just so they are together.

It would seem to me that there would be great economies of scale from using the same vehicles.

Mr. FRANK. We did analyze that issue in 1979 and 1980, although I admit not as thoroughly as it perhaps deserves to be analyzed.

Our conclusion then was that you might somehow be able to have economies of scale through use of vehicles for several purposes. However, there were just a lot of problems in terms of frequency, time of day, which you would want to have one sensor as opposed to another sensor, altitudes, and the like.

So that while you might meld the systems together, it would be very difficult to do so. We judged, ultimately, that one would not do so, that doing so would involve compromising at least one if not all of them.

I am not saying it's impossible. I am saying it's very difficult. And I think at least on the basis of the information we have now, that should not be the basis of the judgment because I think it cannot be demonstrated that there will be efficiencies of scale. And if we were to do it for that reason and there weren't efficiencies of scale, then we would have based it on something that simply did not turn out to be true.

Mr. MACKAY. Thank you, Mr. Chairman.

Mr. VOLKMER. Mr. Lewis, do you have any questions?

Mr. LEWIS. Thank you, Mr. Chairman.

Mr. Frank, if part of the Landsat system was transferred, what parts would you suggest be transferred to the private sector? All of it or parts of it?

Mr. FRANK. I would leave the R&D function with the Government probably. I would probably leave operation and management of the satellite itself to the Government. And some point, perhaps at the raw data point, I would then give the private sector the right to sell that data commercially to almost everyone except the Federal Government.

Now it may be that it wouldn't be entirely raw data. There might be some value-added done by the Government. But I would

give the private sector the right to decide, or a private sector entity the right to decide through a bidding process what it preferred, either totally raw or some manipulation of that data.

Mr. LEWIS. If the United States has the leadership on Landsat systems, do you think it would be wise to give this up?

Mr. FRANK. I personally would not do it, that is not give it up. That is, I would continue to have this kind of a system. We are a wealthy country and the one that is technologically most advanced. And I think we ought to keep that technological advantage in as many areas as we can.

So if I were, in the abstract, making a judgment, I would keep the satellite. If we are talking about budget priorities, however, I think this is an area where it is possible not to have a Landsat system. If the Japanese and the French are going to have systems, and if we can get their data, I think it is possible for us not to have one. Not preferable, but possible.

Mr. LEWIS. Would it be feasible to envision a system where several competing firms in the United States would do marketing for Landsat data?

Mr. FRANK. That's a very good question. That is, assuming you are going to lop off the marketing function, the question then becomes whether you want to give it to one firm, to a consortium of firms, or whether you want to have any firm who wants to market it.

Actually, now, the latter is what happens. That is, the data is provided essentially free. And any firm who wants can engage in value-added and develop a market.

I suppose the argument is that developing good value-added processes and developing markets is an expensive proposition, and that a company will only spend money to do that if it has certain proprietary rights in the information.

I would be prepared to consider giving a company proprietary rights in the information and markets. You might divvey up the markets geographically by the way. You might give one company the right to sell in the United States, and another company the right to sell in Latin America or the like. That would not bother me.

I would treat this, I think, just like a licensing procedure for any product. Assume that a U.S. company has a unique product that other people want, in this case it happens to be the Government that has the product, and it licenses others, either to manufacture or to manufacture in part the value-added process, the product, and then to sell it commercially.

Mr. LEWIS. I would like to get back to the Metsat just for a moment. You touched on it with a few of the questions.

We have a situation where you have an international language, so to speak. With the meteorological systems today any country can intercept your data from Russia, France, Germany, England, it matters not.

How do you feel with this type of system that we now have if this went over to commercialization? How do you—how would this work in the respect that we could as a—and the United States turn this over to the private sector, and then they would code or set up

their own code, and there is no more freedom of information? You have to purchase it now.

Today we receive all this free information from the foreign satellites. Now we would be charged for that as well.

How do you envision that working?

Mr. FRANK. well, I am not sure. That is, I don't favor it necessarily. And I am not sure how it would work.

I assume by the way that if another country were charged for the information from one of our meteorological satellites that, as has been suggested, it would charge us for its information, or might charge us for its information.

And I think we would want to be careful because, if we had a private entity selling the Metsat information, and receiving the benefits of that sale, but the U.S. Government Weather Service wanted to buy other information from that country that it now had to pay for, I think we would be somehow out money.

Mr. LEWIS. You would feel then that it would cost us more in the long run than it does today?

Mr. FRANK. I don't know the answer to that question. I think it is a complicated question. And before suggesting that the system be sold, or that products from the meteorological satellites be distributed commercially by an entity other than the U.S. Government, I think we would have to analyze that to see what the costs and benefits are.

I don't know how that one would come out.

Mr. LEWIS. Thank you, Mr. Frank.

Thank you, Mr. Chairman.

Mr. VOLKMER. Thank you.

Do any other members of the—Mr. MacKay do you have additional questions?

Mr. MACKAY. I just have one other question.

Would you characterize the Landsat technology as a developing technology or as a developed technology? In other words, do we know yet all the applications of this?

Mr. FRANK. I think it is a developing technology. That is, I think that the technology we use 20 years from now will be different from the technology that we have now.

Mr. MACKAY. Is there a dimension of this that would say that maybe we should commercialize this when we've got a full grasp of what all it's useful for? But until we do we should not?

Mr. FRANK. I think an argument can be made that it is unwise to commercialize when the economic viability of the venture is uncertain, in part because of the technology. And that one ought to consider commercializing, or more seriously consider it, when the technology is proven and perhaps when we have more information about the market.

Mr. MACKAY. I am just wondering if in the remote-sensing field it turned out there was something of great value, and say the Japanese had proprietary rights to it, and we found that we were precluded from that part of the information—in other words, we found that later on we suddenly were at a competitive disadvantage because a whole new field showed up that no one had anticipated.

Mr. FRANK. This would assume that we did not have a system and the Japanese had a system?

Mr. MACKAY. That's correct.

Mr. FRANK. First, there would apparently be not only the Japanese system but the French system. So that would be at least a degree of competition among foreign providers of information.

Second, if that situation should exist where very valuable information was not available to us, I would imagine very quickly we could get up a land remote-sensing satellite because we would still be a leader, my guess is, in the general rubric of land remote sensing.

That is, even though we did not have a Landsat or a commercial land remote-sensing satellite, we will know how to produce one, and where we will be at the forefront of that knowledge because we will satellites which are used for other purposes.

Mr. MACKAY. Thank you, Mr. Frank.

Thank you, Mr. Chairman.

Mr. VOLKMER. Thank you.

Thank you, Mr. Frank.

We will have, if it's all right, additional questions to submit to you in writing. We will hold over from the record for a couple of weeks so that you can respond to those. That's in a matter of time. We are running late. It will be four or five questions, if that's all right?

Mr. FRANK. Thank you, Mr. Chairman.

I would be happy to answer those.

Mr. VOLKMER. All right.

[The questions and answers follow:]

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September 1, 1983

Harold L. Volkmer
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Dear Mr. Chairman:

I have just returned from travel and have your letter of July 25, 1983 in which you ask that I respond to a number of questions. I am happy to respond to your letter with the following answers.

Question 1: If a private company were to operate a land sensing system or market the data from the government's system, what specific copyright provisions would be necessary to protect the private vendor?

Answer to 1: I assume a private company would want traditional copyright protection, in other words, the same protection that applies to other proprietary data or pictures would apply to remote sensing products.

Question 2: You state (on page 7) that the key issue which Congress must resolve is whether it is in the interest of the U.S. to have a land remote-sensing satellite system. What factors should Congress consider in reaching a decision on this question? What is your personal opinion about the worth of Landsat?

Answer to 2: The factors Congress should consider in deciding whether the United States should have its own land remote sensing satellite system are the benefits of the information from such a system to our country; the cost of having our own system; and the ability to obtain the information from a system operated by another country (the reliability

of such other system and its cost). Because the United States would continue to have expertise in land remote sensing satellite systems, even if it did not have Landsat, I assume that the United States quickly could develop its own system if, sometime in the future, the system of another country proved unreliable. I believe Landsat information is valuable to the United States and, on balance, I would have a U.S. system. On the other hand, most of the information that would be useful to us could be obtained from other countries, and while I would like to see the United States in the forefront of land remote sensing, some arguments support a policy of buying data from other countries.

Question 3: At the end of your statement, you say that if we transferred only part of the system - the marketing and value-added--then "a regulatory system would not be necessary." Why not? Please explain.

Answer to 3: If only the marketing or value-added aspects of the system were transferred, the activities of the marketer could be limited and directed through a contract as opposed to a regulatory system. Under such a regime, the Landsat system itself and the products would be owned by the government; the private marketer, by contract, would be given the right to market under specified conditions. If the private party violated the contract, it would be replaced.

Question 4: Is there a potential problem if the government runs the satellites and a private operation markets the data? That is, what incentive would the government have to operate the satellites in response to market demands?

Answer to 4: Congress should make clear to the government that one of its objectives is to make money from the system. While private companies may be more responsive to the market, I believe the government would try to serve market demands as it does in other areas even where it does not charge, and will try to increase profits.

Question 5: Does the U.S. get any concrete benefits from the free international exchange of weather data? Do we benefit in the net? Why do we need data from other nations--can't we just use satellite data?

Answer to 5: The United States does obtain benefits from the free international exchange of weather data since we receive, at no cost, data from other countries that helps us with worldwide and U.S. weather predictions and research. Not all of that data can be obtained from satellites. In

our bilateral exchanges, we no doubt give more information than we receive, and consequently it could be said we do not benefit in the net. We have more information about the weather than any other country, and other countries therefore get more information from us than we get from them. If international weather data were sold rather than freely exchanged, the United States probably would make money from the exchange; however, this country would want to think seriously before putting a price on the exchange of such information because of the important worldwide benefits of thorough dissemination of such information.

Question 6: At a recent meeting on land remote sensing the following statement was made:

"In NASA's sphere of operation remote sensing is primarily an aerospace technology. But in the commercial world, remote sensing is a computer and information technology and thus it should be packaged and marketed accordingly."

Do you agree with this? Would you care to comment?

Answer to 6: There is truth to the statement, but the statement probably reflects the fact that NASA puts up the satellites and the commercial world adds value to the information and distributes it.

Question 7: At the same meeting another statement was made about the commercialization process:

"Emphasis should be placed on creating incentives for investment in the next generation of reliable and efficient satellite sensing systems, rather than on unloading the product of past R&D programs."

Do you agree? Would you care to comment?

Answer to 7: The implication of the statement is that past R&D programs have not produced the right remote sensing technology. Certainly past systems can be improved. But whether we wish to create government incentives for the next generation of satellite sensing systems depends on whether or not and to what degree we need a domestic system, an issue raised in earlier questioning.

Very truly yours,

Richard A. Frank

RAF/sg

Mr. VOLKMER. Thank you very much.

Our final witness today is Tom Lillesand, American Society of Photogrammetry, Madison, Wis.

Mr. Lillesand, your statement has been received and will be made a part of the record. You may review the statement or you may summarize it, however you so desire.

You may now proceed.

STATEMENT OF DR. TOM LILLESAND, AMERICAN SOCIETY OF PHOTOGRAMMETRY, MADISON, WIS.

Dr. LILLESAND. Thank you. Mr. Chairman.

I will choose to summarize the statement. It's a lengthy statement. I am also prone, being from the academic community to talk in 55 minute modules and give a quiz at the end. And staff has made it painfully clear to me that that's not the way to proceed here.

You have the statement. I presume that you will be able to follow it quite closely by reading it. But I would like to hit some of the high points.

First of all where I am coming from by way of background is that of a remote-sensing educator and researcher. I have been involved in this game for some 13 years, principally in the applications to agriculture, forestry, and water resources.

The organization that I am here to represent, American Society of Photogrammetry, is the largest technical organization dealing with remote sensing and photogrammetry in the world. It has 8,000 members comprised of researchers, practitioners, and users alike.

It is also an organization which is associated with the American Congress on Surveying & Mapping. This group has 20,000 members, and again represents one of the largest organizations in the world dealing with the issues of mapping, charting, and geodesy.

So what I would like to try to do is to present at least the salient issues as perceived by a broad segment of the R&D community, as well as the user community.

I have structured my testimony in great part in direct response to the letter that invited same. And that is in four different areas.

The first is to try to, as best as one can possibly do, characterize the current Landsat user community. The second is to highlight the need, or the lack thereof, of additional research to develop the applications of the land satellite data. The third is to talk about the existing and prospective benefits of the operation to the Government with respect to public good. And the fourth is an assemblage of some other important concerns.

Let me again say that my remarks relate essentially only to the land observing portion of the system. Though some of the basic principles may apply to the meteorological system as well.

First of all to characterize the user community. The user community is extremely broad. That is, it consists of State and local government, individual commercial entities, the Federal Government, and all of those counterparts in foreign applications throughout the world.

The applications of Landsat have ranged from prediction of storm runoff, or melt from snowfall, to global crop production, to mineral exploration.

As broad as this community is, the one message I would like to convey to you relative to its characterization is that it is extremely fragile. It is fragile for a number of reasons. One, we have only had Landsat data for 11 years. This is the first time that we ever had a satellite system or any other government had a satellite system, that had as its mission looking at the Earth, looking at the land mass of the earth.

It was the first time that we had global synoptic computer compatible data. I can remember the early days as a researcher saying, we just wonder if we will ever have the computer systems to process these data because they are remarkable. We have made a lot of progress. Yet don't forget that the Metsat program had a 12 year head start on the Landsat program technologically.

The user community, besides being relatively immature with respect to the Metsat program, has had to deal with a system that first of all has not delivered over the long term a commitment to continuity of the data. And it is not really a surprise that current potential users are reluctant to make large investments in the equipment, the training and the change of the modus operandi if there is no guarantee that the data are going to be generated in the future.

In essence they aren't going to tool up for the production of a product when they aren't sure that the raw material is going to be around in the future.

Not only has there been uncertainty, there has been a degree of unreliability or unresponsiveness in the existing system in some respects. There is a general lack of standardization of the products. There have been some various technical failures along the way. There has been an unresponsiveness relative to the timeliness of provision of data to users. And there has been sometimes poor communication between the data providers and the data users.

In the same context the user community on the front end began using Landsat data under the fundamental assumption that the Government was providing this data at the cost of reproduction and dissemination only. As you are well aware, over the course of time the pricing structure for Landsat data has gravitated from that philosophy to a philosophy that the cost should indeed reflect a greater proportion of the total operating cost to the system.

Many have pointed out that this is having a negative impact on the user community. And in fact the American Society of Photogrammetry in March 1982 passed a resolution which was forwarded to this committee and the President that essentially pointed out that this shift in pricing philosophy is going to inhibit growth in the market and it would be difficult for the average user to realize the benefits of a promising program for which taxpayers had already contributed about a billion dollars.

Further, some of the members of the society have questioned indeed whether this pricing philosophy may not be in violation of the spirit, if not the letter, of the Freedom of Information Act under which Government documents, unless restricted by reasons of security or privacy, should be made available to the public at a

rate that is limited to reasonable standard charges for document search and duplication.

Another factor is referred to, and I think you have seen it in many of the reports and testimony that have been before you for some time, that the Landsat user community is indeed not aggregated. Contrary to the weather using community, contrary to the communication satellite industry, there is not in place an existing infrastructure for the use of Landsat data.

There is not one department of remote-sensing in this country. When Metsats came about we had telephones. We had TV's. We had speech as a mechanism and knew how to communicate. We still, in great part from a research standpoint, have a solution looking for problems in Landsat. And I think we are making some headway.

But I think that it should not surprise us that there is no single dominant voice before us, either governmental or commercial, that's emerged to take the lead here in light of the aforementioned factors that I mentioned relative to the uncertainty, the unreliability and increasingly costly data provided to them.

We still have a long way to go in converting Landsat data to Landsat information. That kind of linkage exists with weather satellites in great part. Not that all the research has been. I guess if you ask any researcher, you've got to always do more research. But I am trying to point out a fundamental difference.

Let me say in light of an assumption that the fundamental research and the application research has been insufficient, and that the market is very fragile at this point, I, for one, question the fundamental premise that the investment to date in Landsat has been adequate to assess its commercial viability in total.

I guess the more important point, however, is that philosophically I don't believe the cost effectiveness of the system is the fundamental issue at hand. Philosophically the issue is whether this country wants to maintain and enhance a remote-sensing capability to be able to monitor global resources.

As I point out in my written statement, I tend to shy away from the soap boxes and overstatements of the gloom and doom variety. Let me simply reiterate that my colleagues in the scientific community tell me that the future quality of life on Earth is premised on a much more thorough understanding of the physical and biological processes currently operating on this planet.

I frankly, am in no personal position to judge the long term consequences of such complex phenomena as global soil erosion, atmospheric and climatic variation, ocean degradation, tropical deforestation, decertification, acid rain, decreased genetic diversity, energy demand, food and fiber supply, and global population distribution and redistribution.

What I do know, as a member of the scientific community, is that Landsat type technology will radically improve our understanding of these processes if we are given the data, if we are given the systems, and we are given the research capacity to tackle those problems.

In this regard, I find it extremely interesting that at least historically, Government has little difficulty deciding on faith and belief in the ultimate value of science to make substantial invest-

ments in looking at planets other than the Earth, but finds it extremely difficult to make even relatively modest investments in looking at the Earth.

Departing from this philosophical premise, let me indicate that our currently operational system is far from the state of the art. And that over the last 11 years we have been using coke bottles for binoculars. We are just beginning to learn how to handle the TM data. But we have never had thermal land remote-sensing data before in a system. We haven't had 30 meter resolution data. We have never looked in the mid IR. And I could go on with a number of technical things we have not had before TM. But we haven't had time to look at it either, the existing data from the TM.

We are also a long way from having a final fix on how we use these data in terms of formulating vegetative stress indicies, new water quality parameters that are more amenable to the technology that's in hand, to identifying areas of existing or potential soil erosion, for example.

Others have mentioned that not only is there a need for this applied research, but for the long-term R&D. I simply want to reiterate that I concur with the previous witnesses that this is something we must continue to be involved with in grand style, and in fact this function should be enhanced, if I am able to sense the foreign market.

Let me turn to the other item that the committee asked for some input on, and that's relative to the public benefits of Landsat. I think you by now understand my opinion relative to the need for natural resource assessment and environmental monitoring capabality via remote-sensing.

May I also say that I and the organization that I represent believe commercialization is inherently desirable as an objective for our civil programs, if indeed implemented at the proper time, at the proper rate, and in a fashion insuring the greatest service to the national interest.

As pointed out by the others, particularly Mr. Frank's statement, there is little doubt but what the private sector can play a stronger role in marketing remote-sensing data.

The other side of that coin, however, is that industry is not the proper entity to be charged with the foreign policy implications, the environmental preservation and security implications of these systems.

Another fundamental paradox, building on the question related to the pricing of Landsat data, is that the value of data for certain applications goes up inversely to distribution. That is to say if you are the only one that knows where a potential oil strike might be, or you are the only one that knows what the wheat production is going to be in Russia, you'll pay alot for that information.

Running in the face of that, however, is the reverse in terms of the scientific value of the data. If tropical deforestation is indeed a real problem, and estimates are that the rate of deforestation is on the order of 100 acres a minute globally, and that it may have something to do with changing the reflectance patterns off the surfaces of this globe, which in turn changes polar circulation and tropical circulation, which influences the weather in the heartland of America, I would submit that this is important scientific infor-

mation. And the more eyes we have looking at that type of problem the better off we will be.

In terms of other concerns let me specify I think we are indeed on the verge of a true explosion of the information society, if you will. And that we have not only remote sensing, but that we have global positioning systems, we have inertial navigation devices, we have microprocessing technology, record and data based management systems which will revolutionize, potentially, how we manage and measure the Earth. It's a more general assessment that we have to make. We have the opportunity to rethink what's important and how we collect Earth resource data.

It makes little sense to continue in our disjoint, oftentimes redundant, ways of mapping our domestic resources and those of the globe; of administering the conveyance of property, and the collection of physical and environmental records in general. In this regard, both ASP and ACSM the organizations I represent, commend your colleague, Mr. Lujan, for his foresight and confidence in the scientific community in the introduction of legislation to study the feasibility of establishing a multipurpose cadastre. The manner in which such a mechanism would be established is important as we view the land remote-sensing future, as well.

Another concern and comment is this question about a potential data gap. To say that the timing of a decision is critical is a severe understatement. While, indeed, we may be able to put in place a data collection system if we can't get data from the French, or if we can't get the data from the Japanese, the information that is provided to me from the relevant Federal agencies says we're talking 4 to 5 years for a new start. I don't think that in the future we want to say if we can't get data—we'll wait 5 years and we'll have our own source again.

Relative to foreign competition, the French Spot satellite is scheduled for launch in 1985. Strong French Government and industry presence is already here in the United States. There is a simulation campaign where airborne data are provided to show users what's going to come from the eventual satellite system. At the same time, as I go to technical meetings, in a professional sense, and we say, "Gee, it's too bad we don't have a decision yet on the Landsat program," representatives from France are talking about the design—not of Spot I or Spot II—but of Spot III and Spot IV. We're in this game forevermore is what they're telling us.

They write off their space segment, they write off their R&D as an investment in their future both environmentally and commercially.

There is also a very strong presence of foreign entities in our American educational system where dollars to support graduate research and instruction in this country are few and far between in remote sensing. We have a very strong influx of people from other countries and this international communication, indeed, has many positive benefits because of the establishment of a communication in a scientific sense that I think is important to the peaceful habitability of Earth. On the other hand, we are not providing from our educational system the American people needed to occupy the positions in the user community to understand what the data can do. We just are not training people.

Let me wrap up here by saying that one of the things that has perplexed remote sensing and has been articulated in different forms to you previously, is that one of the most significant problems has been the lack of the direction for the program and that we just don't have a good viable mechanism right now for communication between the academics, industry, and government to get the job done.

Just as Congress, in the past, has considered legislation to establish national space policy, perhaps it would be prudent to draft and enact a National Remote Sensing Policy Act. We will really reserve final judgment on the specific form commercialization might take, pending the specific response from industry to the RFP currently under development. In the interim, it appears to us that a staged approach to any transfer of the land observing system to the private sector, commencing with the ground segment based upon a strong value-added industry is the most practical approach. This ground segment should include adequate acquisition, archiving, and data distribution capability for all users under the open skies policy, at equitable prices.

Aggressive R&D is needed; funds to provide for program continuity are essential immediately, and by this, I mean, more than the current generation-plus-one satellite capability that we have. Aggressive marketing, a reasonable pricing structure, and an institutional structure for clear policy development are critical.

In light of the foreign competition the worst thing we could do is further delay our action. The impact of that is effectively to preclude the domestic commercial opportunities that I think all of us would like to try to nurture.

While our civil remote-sensing program has some shortcomings, much has been accomplished in the last decade. The exciting fact to me, and to others in the user community, is that we've only begun to scratch the surface of remote-sensing's role in improving our understanding and management of the atmosphere, the hydrosphere, the lithosphere, and biosphere. The real challenge, then, before us today is to recognize our remote sensing program as a public good and to formulate a policy for that program which will insure future scientific advances, assist in the proper stewardship of our natural resources, provide creative commercial opportunities, and bring remote sensing to a much higher position on our national agenda.

That concludes my statement

[The prepared statement of Dr. Lillesand follows:]

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Testimony of Dr. Thomas M. Lillesand

Professor of Remote Sensing, University of Wisconsin-Madison

on behalf of the

American Society of Photogrammetry

before the

Subcommittee on Space Science and Applications

and the

Subcommittee on Natural Resources,
Agricultural Research and Environment

House Committee on Science and Technology

July 21, 1983

Mr. Chairmen, members of the subcommittees, thank you for the opportunity to testify today concerning the proposed commercialization of the civil space remote sensing systems. I come before your subcommittees in the combined capacity of a remote sensing educator and researcher, and as a formal representative of the American Society of Photogrammetry (ASP). To elaborate briefly upon the personal and organizational perspectives which I am here to present, let me say that my personal perspectives derive from involvement in university remote sensing teaching and research for the past 13 years in the states of Minnesota, New York, and Wisconsin. My expertise resides primarily in land applications of remote sensing having conducted formalized remote sensing research programs in agriculture, forestry, land use analysis, and water resources. I currently direct the operations of an interdisciplinary remote sensing research center at the University of Wisconsin-Madison. I also hold academic appointments in our university's Institute for Environmental Studies, College of Agricultural and Life Sciences, and College of Engineering.

The organization I am here to represent, ASP, was established in 1934 and is the world's largest professional/scientific society devoted to the exchange of ideas and the dissemination of knowledge and new information about the application of the combined fields of photogrammetry and remote sensing. The society's 8,000 members come from across the spectrum of education, all levels of government, industry, and private practice. Hence, the membership of the society includes technical researchers, practitioners, and end-users alike. One of this organization's principal activities is the publication of scientific literature on the subject of remote sensing such

as the Manual of Remote Sensing and the monthly journal Photogrammetric Engineering and Remote Sensing. These publications are recognized internationally as authoritative sources on the state of the art of remote sensing.

In addition, ASP is affiliated with the American Congress on Surveying and Mapping (ACSM), a national professional society with 20,000 national and state members in the fields of surveying, mapping, and geodesy.

Before I begin to treat the substance of my testimony let me underscore the difficulty of one's trying to present the view of an 8,000 person organization as diverse in its membership as ASP. The best I can hope to accomplish is to present to you some of the salient issues which a broad segment of the remote sensing R&D and user community deem significant in the ongoing debate on the feasibility and appropriateness of transferring all, or portions, of the civil space systems to the private sector.

I have structured this testimony in direct response to the committee's specific request for information on: 1) Characterization of the Remote Sensing User Community; 2) Need for Additional Research to Develop Applications of Satellite Data; 3) Public Benefits of a Government Remote Sensing Program; and 4) Other Concerns. Again, let me emphasize that my remarks relate primarily to the land observing program (Landsat), though many of the same issues relate to the existing meteorological satellite program and the prospective ocean program(s).

CHARACTERIZATION OF THE USER COMMUNITY

Anyone who has followed the development of remote sensing policy over the years is aware of the scores of hearings and studies that have dealt with characterizing the Landsat user community. Rather than attempting to reiterate the genesis and results of these various activities, suffice it to say that the Landsat user community is indeed broad. Landsat data are used to varying degrees by our federal, state, and local governments as well as by the private sector and the foreign counterparts to each of these groups. Landsat data have been used for everything from predicting snowmelt runoff, to aiding in petroleum and mineral exploration, to assisting in the estimation of wheat production on a global basis.

I am most personally familiar with the uses of Landsat data at the level of state government. For example, in our state Landsat data have been used for such applications as:

- quantification of the water quality (trophic status) of all public waters in the state to assist in lake preservation and restoration management,
- assemblage of statewide land use inventories to facilitate generalized land use planning efforts,
- analysis of vegetation associations to support generalized wildlife habitat assessment,

- completion of county inventories of agricultural crops to assist such programs as farmland preservation, irrigation management, soil erosion control, and flood/drought damage assessment,

- assistance in the mapping of the surficial glacial geology of the state,

- detection and quantification of large area, commercially significant insect problems (e.g. spruce budworm defoliation) in the forested areas of the state,

- study of coastal processes operative along Lake Michigan and Superior, and

- analysis of watershed land cover patterns to aid in streamflow estimation and assessment of non-point pollution impacts on receiving waters.

While the above list illustrates the broad applicability of Landsat data to a range of resource management tasks at a statewide level, it should be pointed out that the above efforts have been conducted under essentially research conditions. That is, these programs have by and large been cooperative university, state, and federal activities conducted on a pilot project basis. Frankly, some of these exercises have produced some rather discouraging results. Most, however, have underscored the tremendous potential Landsat data hold for assisting a number of operational resource management activities in the state.

I would like to emphasize the concept of the potential, rather than the reality, of the user community's employment of Landsat data on a day-to-day basis. While I am not familiar with all segments of the user community, those with which I am currently represent a rather fragile market for Landsat data. The reasons for this are many and varied but they revolve principally around the following:

- The continued uncertainty about the status of the Landsat program. Current and potential users are reluctant to make large investments in equipment and training, and to modify existing methods of data acquisition in the absence of an assurance of long-term data availability.

- The conduct of the Landsat program fundamentally as an experimental, rather than operational, activity. Throughout the program users have been frustrated by such factors as: the inability to obtain data in a timely fashion; the lack of standardization of the data products made available (e.g., changing formats of computer compatible tapes, changing geometric and radiometric processing of the data); the various technical failures of the system (e.g., the failure of the thermal channel and the presence of the line start anomaly on Landsat 3, the transmission and power problems on Landsat 4); the program's inability to tailor products to specific user needs; and the sometimes poor communication between the data providers and data users.

The kind of problem I'm referring to in this latter area is typified by a situation we encountered some time ago in Wisconsin. Our Department of Natural Resources deployed substantial resources to collect field water quality data on a number of lakes in the state coincident with the overpass

of Landsat-3. Without advance notice to users (but for sound technical reasons), a switch was made from Landsat-3 back to Landsat-2 as the primary sensing system. That meant the very costly field observations made in support of a Landsat 3 overpass were 9 days out of synch with the schedule of the primary satellite. Accordingly, these field measurements were virtually worthless for calibrating the available satellite data. This kind of experience can influence greatly the user's overall confidence in system operation. Ironically, the whole circumstance could have been avoided by a user-supplier communication mechanism as simple as a daily recorded tape enabling a telephone check on system status and data collection progress.

A final point to be made about the experimental flavor of the Landsat program, particularly early on was the tendency for some to present or perceive Landsat data as an information panacea. This problem stemmed primarily from early over-enthusiasm and lack of experience with the data. Nonetheless, some users have been hesitant to take a second look at the potential utility of Landsat data because of early overselling or overbuying of the technology.

- The fundamental shift in the philosophy determining the price structure for Landsat data. At the beginning of the Landsat program prices for the data reflected only the actual cost of reproduction and dissemination. That is, data prices were set using the same philosophy governing the costs charged users for such items as government maps and aerial photographs. Currently, prices are not set by the cost of data reproduction and dissemination, but rather by the principle of using data sales to recover a greater share of the costs of the entire Landsat system. This shift in philosophy has been a deep concern to ASP for some time and on March 18, 1982 the society's Board of Directors passed and forwarded to this Committee and to the President, the following resolution:

  "WHEREAS the American Society of Photogrammetry which represents the collective disciplines of photogrammetry and remote sensing, is aware that the prices for copies of Landsat data were increased in October 1981, and are schedule to be raised again (more than doubled) in October 1982;

  WHEREAS the current prices have already resulted in a significant decrease in the volume of Landsat product sales;

  WHEREAS the full value of Landsat data for current and future government and private applications (including data from the new Landsat D) can only be realized if the data continue to be available at reasonable prices; and

  WHEREAS the October 1982 prices will inhibit all but the most affluent users from purchasing Landsat products, and it will be difficult for the average user to realize the benefits of a promising program for which taxpayers have already contributed about 1 billion dollars.

  NOW, THEREFORE, BE IT RESOLVED that the Society recommends that the U.S. Government maintain prices for Landsat data which reflect actual cost of reproduction and dissemination."

Recently announced prices for Landsat Multispectral Scanner (MSS) data in computer tape form indicate that an image costing $200 in 1980, costs $650 today, and will cost $730 in 1985. A tape for one scene of data from Landsat-4's Thematic Mapper (TM) costs $2,800 today, will cost $3,400 this October, and $4,400 in 1985. It is our feeling that this price structure does not serve the general public well and that data sales will likely decline in response to these increased costs.

Another question raised by certain members of ASP about the current pricing structure is its potential violation of the spirit, if not the letter, of the Freedom of Information Act. This law seems to establish the policy that all government documents (unless restricted for reasons of security or privacy) should be made available to the public according to a uniform schedule of fees "limited to reasonable standard charges for document search and duplication."

- The lack of aggregation of Landsat users. The Landsat user community is still very immature, technically and institutionally, in its ability to employ Landsat data to their fullest extent. While results to date have been most promising, the land remote sensing market is not yet analogous to that typifying the communications satellite industry. This latter industry enjoyed the benefit of having large ground systems for utilizing the satellite data already in place when the satellite systems were originally developed. Landsat represents an entirely new source of information that we are just beginning to learn how to use. This fact, ironically coupled with the very multiplicity of potential uses of the data has limited the development of a concerted voice on behalf of the program. In my estimation, no single dominant civil application group (governmental or commercial) has emerged to lead the demand, or guide the philosophy, for a transfer to a fully operational program status. However, given the aforementioned factors this situation should come as no surprise. The "loud silence" you may be currently hearing from the Landsat user community does not mean one does not exist. With the exception of the geologic elements of the community (represented by the Geosat Committee, Inc.), it is simply too new and diverse to have an articulate voice expressing its needs and concerns.

NEED FOR ADDITIONAL RESEARCH TO DEVELOP APPLICATIONS OF SATELLITE DATA

There is little doubt in my mind that further research is needed to fully develop the applications of satellite data. Again, it has only been some 11 years that the research community has had access to repetitive, global, multispectral, earth resource data in a computer compatible format. Since then we've made tremendous strides in acquiring and processing these data but we still have substantial amounts of both basic and applied research to do to be able to fully transform satellite data into useful information for decisionmaking. Our baseline information on the spectral properties of the atmosphere, biosphere, lithosphere and hydrosphere is simply insufficient to fully exploit satellite remote sensing data at this time. While this new measurement tool is enabling us to develop a whole new

array of parameters expressing the quantity and condition of earth resources, developing these procedures takes a great deal of time, thought, and experimentation. On this basis I question one of the fundamental premises that has led to the whole subject of this hearing. That is the judgement that the investment in Landsat to date has been sufficient to permit the evaluation of the operational uses of the data and, if these are cost effective, to attract a private sector owner/operator. In my opinion, more research is needed to continue the development of operational applications of the data. Further, I don't believe cost effectiveness is the basic issue at this point in time.

As a scientist I tend to shy away from soapboxes and overstatements of the gloom and doom variety. But let me tell you that my colleagues in the scientific community tell me that the future quality of life on earth is premised on a much more thorough understanding of the physical and biological processes currently operative on this planet. I frankly am in no position to judge the long-term consequences of such complex phenomena as global soil erosion, atmospheric and climatic variation, ocean degradation, tropical deforestation, desertification, acid rain, decreased genetic diversity, energy demand, food and fiber supply, and global population distribution. What I do know is that satellite remote sensing can play a central role in better understanding all of these phenomena if we have the systems and the research capacity to tackle the problem. It is very hard for me to attempt to assign a dollar value to what we might learn in the process.

I find it interesting that at least historically government has had little difficulty deciding--on faith and belief in the ultimate value of science--to make substantial investments in looking at planets other than the earth, but finds it very difficult to bring itself to make even relatively modest investments in looking at the earth. Again, we must consider the scientific value of Landsat data along with their market value in implementing our present decisionmaking process.

Departing from the philosophical premise for the need for additional research with Landsat, I'd like to also point out that by current technological standards our "operational" system is already archaic in many respects. Though data from the Landsat MSS system has had a range of application throughout the world, from a technical standpoint the system corresponds to using coke bottles for binoculars. Many potential users who have had high hopes for employing Landsat MSS data in their work have concluded that the 80 m resolution data available for the past 11 years are simply inadequate for their needs. However, when Thematic Mapper (TM) data become more generally available, we will see a quantum jump in the applications of satellite remote sensing if there is sufficient research to develop same. TM data are in new spectral bands and in a more finely tuned format both spectrally and spatially. The resolution of TM is 30 m in all of its visible and reflected infrared channels--a substantial improvement over the 80 m resolution of the MSS. The price paid for this increase in detail is an increase in data rate and volume. This translates into a range of research tasks aimed at improving the capacity and efficiency of computer processing the data in a form broadening its application. We are just beginning to learn how to handle the TM data stream. Much research remains in the area of understanding what the information content of the data stream is.

Along with the research to be done in support of the use of TM data is research on the application of other important systems such as the Large Format Camera and the Shuttle Imaging Radar systems. These systems are part of what has to be a much larger and longer-term commitment to fundamental R and D in sensor system development to guide the design of our "operational" systems of the future. In short, whether we "hand over" all or parts of our operational systems to industry, government must continue and enhance its program for fundamental, high-risk R and D. Private sector companies, with limited capital, simply will not invest in such high-risk ventures where the payoff is a long time off and where they have no assurance that the benefits of their investment will accrue principally to them. Continued government support of short-term research to nurture the application of TM data and long-term research and development for the definition of future systems is imperative if the U.S. is to continue its leadership role in remote sensing.

PUBLIC BENEFITS OF A GOVERNMENT REMOTE SENSING PROGRAM

I and the organization I represent believe commercialization is an inherently desirable objective for our civil remote sensing programs, if implemented at the proper time, at a reasonable rate, and in a fashion insuring the greatest service to the national interest. There is little doubt that the private sector can play a strong role in marketing remote sensing data and tailoring the data to more specifically meet various user's needs. Thus, the potential benefits from nurturing multiple value added service companies in a highly competitive environment are indeed great. Likewise, as remote sensing technology matures a range of industries will likely develop to provide launch, reception and dissemination services aimed at meeting the needs of particular high value portions of the market. However, it does not follow that government should simply get out of the remote sensing business. Strong government involvement will continue to be a necessity from a number of standpoints.

First, a fundamental paradox confounds the issue of running our operational remote sensing program as a totally business venture. Often the economic value of the basic product involved, earth resource data, increases inversely with its distribution. For example, the value of data to support such market activities as petroleum/mineral exploration or knowledge of Russian wheat yields increases as the distribution of and access to these data becomes more restrictive and limited. In contrast, the scientific impact of data on such phenomena as tropical deforestation increases dramatically as its distribution broadens. This leads to the question of the extent to which our program should be driven by a return on investment strategy or by a philosophy of enhancing the public good derived from the data. Again, I'm personally incapable of putting a dollar amount on the importance of our monitoring the resources of this planet. All I can say is that it is in the national--actually the global--interest that we continue to do so.

In a related vein, as remote sensing technology matures in this country and elsewhere, it will contribute substantially to the overall collection of economic and environmental intelligence. The related security and foreign policy issues will accordingly multiply over time and these concerns will

have to be dealt with by government directly--irrespective of industry's role in an operational system. Just as government is an inappropriate entity for marketing remote sensing; industry should not be expected to guide remote sensing's role in international trade, global environmental protection and foreign relations.

On this latter point I'd like to emphasize the goodwill our land and weather observing programs have established. The U.S. is recognized for leading the way--both in technology and policy--toward the establishment of cooperative global satellite information collection and dissemination. Our numerous cooperative agreements in the foreign sector have served us well and we must continue to remember the value of this cooperation as we define industry's role in our operational program.

OTHER CONCERNS

- Interwoven with the potentials of remote sensing are those of other related technologies impacting how we will monitor and map the earth in the future. Among these related technologies are precise global positioning systems, inertial surveying devices and computer-based land information systems. With these systems, the potential for closing the gap between our ability to acquire earth resource data and to store and interrelate these data with other land-related information is in view. The technological capacity will soon exist to integrate the vast array of legal, fiscal, and environmental records we collect about our land on an accurate geodetic base. In light of these evolving technologies we could soon have an integrated network of federal, state, and local multipurpose land information systems which would greatly facilitate how we convey property, administer land taxation programs, and manage our land resources and environment. These technical developments afford a tremendous opportunity to reflect upon where we've been and think about where we should head in the collection and integration of land related information in this country.

It is with this issue in mind, Mr. Chairman, that ASP and ACSM commend your colleague Mr. Lujan for his foresight and confidence in the scientific community, in his introduction of legislation to study the feasibility of establishing a multipurpose cadastre. The Federal Land Survey Act, H.R. 4399 in the last Congress and H.R. 2279 in the current session, is an important step toward coordinating our nation's fragmented and duplicative land information systems.

As the National Research Council of the National Academy of Sciences has pointed out on several occasions, it makes little sense to continue our country's current multiplicity of disjoint, limited-focus land data collection programs (e.g., property mapping, topographic mapping, tax mapping, soils mapping, land use mapping, wetlands mapping, mined land reclamation mapping, etc.). We must evolve toward the implementation of multipurpose land information systems (cadastres) at all levels of land management in a coordinated fashion. Accomplishing this evolution technologically and institutionally will take some creative planning. The manner in which remote sensing data can and should be integrated into such systems must be

considered carefully as we define the future form of our programs. ACSM-ASP commend Mr. Lujan's bill to your attention.

- To say that this is a critical time for our country's remote sensing program is a severe understatement. In theory, Landsat D' is scheduled to operate until 1988. With the early technical problems being realized by the Thematic Mapper onboard Landsat-4, Landsat D' could have to be launched early and data continuity could be interrupted before 1988. It should be noted that nothing is currently planned beyond Landsat D'. With the lead time needed for system development, a decision to pursue some form of program must be made now for data acquisition to continue without interruption. In the absence of such a decision, not only may opportunities for effective commercialization be lost, but also the U.S. leadership role relative to the foreign sector will be at stake.

The French SPOT satellite is scheduled for launch in January, 1985 and strong French government/industry presence in the market is already being felt with an aggressive nationwide SPOT simulation campaign. In this campaign, prospective SPOT data users are being afforded a preview of the form and quality of the future satellite data through the supply of essentially equivalent customer-tailored airborne coverage. As users are obtaining their preview of the data to become available from SPOT 1 and 2, France is simultaneously announcing their plans for the design of SPOT 3 and 4.

It should be noted that the French are writing off the costs of operation of the space segment of their remote sensing system in the hope that the activities of their ground segment will lead to new information technologies that will rapidly enhance growth and development of their economy. For this reason it is doubtful that a United States commercial venture which attempts to recover the costs for operation of the space segment will be able to compete on an international basis without government support.

In addition to supporting the space segment of their programs, competitors such as France and Japan also "write off" aggressive research and development efforts within their government as investments in their economic future. Of concern here is the fact that industry respondents to NOAA's recent Request for Information (RFI) on the conduct of the civil program proposed very conservative, proven technologies for new systems to be utilized in the next decade. Accordingly, I wish to reemphasize that any plan for commercialization must be paralleled with an accelerated program for remote sensing research of a fundamental, high-risk, and long-term nature. The responses to the RFI underscore the fact that such research and development of advance technology will not be done by industry. Industry will focus on applied, low-risk, and short-term research to improve profitability using current, proven technology. Our government must commit now to the aggressive R and D necessary to keep our industries competitive.

Before departing from the theme of the international arena, I would also like to point out that while funds to support graduate instruction and research in remote sensing are currently few and far between in the U.S., numerous foreign students and scholars are being supported by their governments to study this subject--both here and abroad. We must be concerned about improving the educational opportunities in remote sensing for our future resource managers. One indication of this is the fact that the

Society of American Foresters recently reported that fewer than 60% of accredited forestry programs nationwide provide adequate instruction in remote sensing. Equally disturbing is the fact that the Mapping Science Education Data Base indicates that fewer than 10 remote sensing courses are taught in the entire country in the context of an agricultural discipline. Not only to remain competitive, but also to invest in our future we must enhance the educational development of this field hand-in-hand with our R and D efforts.

- The complexity and importance of designing, implementing, and maintaining an operational system--technically and institutionally--suggest the need for a new approach to conducting our civil remote sensing program. In this regard we note the recent report of the Land Remote Sensing Satellite Advisory Committee emphasizing that "One of the most significant problems in remote sensing has been the lack of direction for the program." The report suggested a Board of Directors for Civil Remote Sensing to evaluate Governmental programs of research, industry proposals for commercial activities, etc. The primary purpose of such a group would be to maximize commercial opportunities while insuring the public interest is being best served. Such a board could be appointed, and report to, the President. It could have representation from government, industry, academia, and relevant professional societies. This would provide a mechanism for broadly-based remote sensing policy development at the level where it is needed. We submit that some such model is needed in order for government, industry, and the scientific community to develop a good working relationship in the whole area of satellite remote sensing.

GENERAL RECOMMENDATIONS

Just as Congress has in the past considered legislation to establish national space policy, perhaps it would be prudent to draft and enact a National Remote Sensing Policy Act. We can't estimate the impact of the commercialization process until its form and limits are defined. While the government might "turn over" portions of the operation, it simply can't turn over its responsibility for the operation of the land, weather, and ocean satellite programs. Again, neither I, nor the society I am here to represent oppose the concept of commercialization if its implementation recognizes the various issues I have attempted to summarize. We must give the ongoing decisionmaking process an objective chance and participate with a perspective of creativity rather than criticism--for commercialization in some form and extent will likely impact the use of remotely sensed data in many favorable ways. We reserve final judgement on the specific form commercialization might take pending the specific responses from industry to the RFP currently under development. In the interim, it appears that a staged approach to any transfer of the land observing system to the private sector, commencing with the ground segment based upon a strong value-added industry is the most practical approach. This ground segment should include adequate acquisition, archiving, and data distribution capability for all users under the open skies policy, at equitable prices. This approach would allow for the continued development of an effective user base and would provide simultaneously for an effective vehicle for the input of user requirements into the system.

CONCLUSION

The question of what form our civil remote sensing program should take over the long-term simply has no clear-cut answers. However, what is clear is that it is time we make a substantive investment of thought and dollars in crystallizing such a program and recognizing its importance to the national and global interest. Aggressive R&D is needed; funds to provide for program continuity are essential immediately (i.e., satellites beyond Landsat D'); aggressive marketing, a reasonable pricing structure and an institutional structure for clear policy development are critical.

In light of foreign competition, the worst thing we can do is further delay our action. This has the long-term impact of effectively precluding the domestic commercial opportunities we are trying to nurture.

While our civil remote sensing program has some shortcomings, much has been accomplished in the last decade. The exciting fact is that we've only begun to scratch the scientific surface of remote sensing's role in improving our understanding and management of the atmosphere, lithosphere, hydrosphere, and biosphere. This will become increasingly apparent as experience with Landsat-4 TM data is acquired. We have the opportunity to employ this technology to aid in the revitalization of our economy, to enhance our international prestige, to revolutionize our methods of scientific inquiry, and to improve international communication and cooperation. The real challenge before us is to recognize our remote sensing program as a public good and to formulate a policy for the program which will insure future scientific advances, assist in the proper stewardship of our natural resources, provide creative commercial opportunities, and bring remote sensing to a much higher position on our national agenda.

With the Age of Information upon us, remote sensing holds the potential to play an increasingly important role in providing for the improved peaceful and bountiful habitability of Earth. The long-term global implications of the choices made on the form and conduct of our civil remote sensing programs are indeed profound. The World has patiently awaited our decision on this issue over the last several years, but this patience is wearing thin.

Mr. VOLKMER. Thank you very much, Dr. Lillesand.

Does the gentleman from California have any questions?

Mr. BROWN. Let me say first, Dr. Lillesand, that I find that your statement is extremely challenging and stimulating. It certainly provides a great deal of insight into the directions that we could be going, and I want to thank you and express my appreciation to the thought that went into it.

I notice that your society has an office over in Falls Church. Could you describe the nature of that office?

Mr. LILLESAND. The society office coordinates the activity of this professional organization with respect to being a central clearing house for membership and the distribution of publications and so forth. There is no technical function served by that office per se in remote sensing. It is, indeed, the headquarters, if you will, for the organization and no more, technically.

Mr. BROWN. Mr. Chairman, Dr. Lillesand refers to the Land Remote-Sensing Satellite Advisory Committee and their recent report. I don't recall that I've seen that. Could we make sure that the committee has a copy of that in our files.

Mr. VOLKMER. Yes; we'll obtain a copy of that.

[The report is printed in the appendix.]

Mr. BROWN. Thank you.

You also recommend, or you state, that it would be prudent to enact a National Remote Sensing Policy Act. Has the society or any of its organs given thought to the drafting of such an act—general format?

Dr. LILLESAND. In terms of having something on paper at this juncture, no. But there certainly is a positive disposition in the society to assist in any way possible if that would be desirable.

Mr. BROWN. You described this as a National Remote Sensing Policy Act; you don't limit it, at least in the title, to the land resources or ocean resources. May we presume that one act could be broad enough to include a total remote-sensing function; that is, both an oceanic and land remote-sensing policy statement.

Dr. LILLESAND. I would see no reason why it could not capture all of them, and I could also see many reasons why it would be desirable. Such that we could get a fully systematic approach to this business of looking at the globe from above. In regard to the ocean satellites, again, I'm not in any position technically to be able to give a definitive answer about the future disposition of those systems. I do know, however, from a technical standpoint we have had only limited experience in that we only had 99 days of data from the Seasat satellite prior to its failure. We've got to be thinking about what we're going to be doing over the long haul in ocean sensing.

Mr. BROWN. Well, this committee has given consideration to the authorization of a national ocean-sensing satellite, this so-called NOSS program, but for budgetary reasons we didn't proceed on that. Since both functions fall within the scope of the activities of NOAA, it would be at least conceivable that the purposes that you're suggesting could be accomplished by an amendment to the NOAA organic legislation providing some of the mechanisms that you suggest. I like the suggestion that you say is included in the advisory committee report for a board of directors representing the

private and public sectors so that policy could be brought to bear on a program on that sort. I think that would be extremely helpful.

Another aspect of your statement that struck me, and that you gave some emphasis to, was what you described as the archaic state of the technology that we're currently using. I've always had the image of our space program as being way out in the forefront of technology and certainly far ahead of the rest of the world, but you don't seem to have that same concept, and you certainly give adequate factual basis for making that kind of a statement.

What I am getting to is whether or not it's conceivable through aggressive research to develop an advanced system which would put us ahead of the Japanese and French, perhaps integrate some of these systems that you've mentioned such as the large camera and shuttle imaging radar systems which produce some striking data with regard to conditions in various parts of the Earth. I recall a science magazine article detailing subsurface observation of the Sahara Desert in Egypt which revealed certain archeological data which had never been observed before, never been known before. Is it conceivable that we could, through an aggressive program, develop a composite system that would produce data from all these sensors and details which would be an advance of what we now see being commercially available, and continue to provide the leadership for the United States that we originally had?

Dr. LILLESAND. No question in my mind but what we could do that technologically. Our limitations to this juncture have been basically institutional. That is to say, and building upon your earlier point, that we have done a much better job at getting things up there than developing a means for using them.

We currently are taking handheld pictures, either out the front windshield or in the bubble on the top as the shuttle rolls over to be in Earth-orbiting view with a 70-millimeter camera.

Mr. BROWN. It's a very good camera.

Dr. LILLESAND. It's a very good camera but it's like using an instamatic when compared to the large format camera that we have available to us.

Mr. BROWN. Is that the Hasselblad?

Dr. LILLESAND. It's a Hasselblad camera that is used currently.

The large format camera data will be in users hands, hopefully, after a couple of shuttle missions coming up in the next calendar year.

I think it's unrealistic, first of all, given the charter of the organization, NASA, to expect them to do a good job at disseminating the data they've produced. I guess the only analogy I could make is that of asking the director of research for Eastman Kodak to be enamored with the job of processing movie film. These people can get us on a cutting edge that would certainly put us out in front. However, we've got to follow it up with a data distribution and operational research program to bring our programs the last mile.

There is no question in my mind but what if we commit, in terms of policy, to being No. 1 in the world in remote sensing forevermore, there are no technical limitations to our doing that. We need that policy.

Mr. BROWN. I was struck also by your observation, and I don't know precisely how accurate it is, regarding the effort that we

spend in scientific research in our planetary program on observing the surfaces of the other planets compared with what we do in terms of a vigorous program in observing the Earth, and I'm also reminded that we're about to put in place a new space telescope which will produce, apparently, a huge data stream about the remote reaches of the universe. It's such a huge data stream, as a matter of fact, that I think we've had to provide satellite data processing capabilities and an institute at Johns Hopkins managed by an international consortium, or least a national consortium with some international participation, with which to plan and manage the uses of the data that will come back, which seems to be an effort substantially in advance of what we're doing on Earth observation and data. Would that be your observation?

Mr. LILLESAND. I think that's my observation. It's akin to trying to take a drink of water out of a fire hydrant. The data rates are very extreme. It would be nice if we had the space telescope philosophy turned 180 degrees—toward Earth.

There's no technical reason why we can't have, if not a geostationary, perhaps a low orbit system transmitting real time data to the individual farmer's dish behind the barn, hooked up to that individual farmer's microprocessor to assist in making real time management decisions relative to crop management—technically.

Mr. BROWN. Serving on the Agriculture Committee, as I do, I'll immediately raise that possibility. See if we can buy it over there.

I am interested, specifically, in your experience in the State of Wisconsin. You've indicated a number of fruitful areas there, but point to the difficulties from the current situation as it involves both the type of data and the continuity of data.

Have you given thought to your capabilities in the State of Wisconsin, and the value to the State of Wisconsin, of an advanced technology capability which would be at levels of resolution, the sort that you hinted at and including the wider range of data. Assume we had an advanced system and we were assured the continuity of the data and we had the data processing capability, have you given thought to how this would enhance and improve the operations of the various programs in the State of Wisconsin that you're familiar with?

Dr. LILLESAND. In the context of even the existing technology, of course, we've surfaced some of these potential enhancements in existing operations, maybe to the point of some extremes. In the agriculture area it would be very nice to have high resolution TM-type data, again, in real time to assist in irrigation management in the Sand Plains potato country; to assist in the early warning of crop stress; to guide management decisions relative to the applications of herbicides, et cetera. That assumes that we get the date in near real time, however. In the water resource area, current Landsat technology has been used in support of section 301 requiring the—Federal Water Pollution Control Act amendments—requiring that each State inventory its public waters relative to their status of eutrophication. For a State like Texas that may not be too much of an economic burden, but for a State like Minnesota or Wisconsin the ability to obtain that information from a satellite is the only way scientifically and monetarily to go.

Mr. BROWN. Can you actually make accurate estimates of the eutrophication from the satellite data?

Dr. LILLESAND. That is correct. In order to do that we had to go through the whole process of developing the analytical models to say that, gee, this is a completely different way of looking—we used to put a white disc off the side of a boat, measure how long it took before it, you know, disappeared and that was our handle on, at least the optical parameters of the water.

Now, we're saying from 569 miles we have multispectral data in a computer compatible form that seem to correlate with the water quality conditions on the ground. And if we can get limited ground observations at the time the satellite comes overhead we can then use those to be elsewhere in the State via satellite, rather than on the ground. So, it isn't a complete replacement for ground technology, but a way of enhancing it.

Mr. BROWN. I've seen some indications, comments, and stories in the press, that even with the present capability we could have managed the calculation of snow pack and water runoff in the Colorado River so as to hopefully avoid the millions of dollars in damage through flooding that occurred this last month.

Does that seem a reasonable possibility to you?

Dr. LILLESAND. Again, I'm not completely familiar with the details of that case. But I am familiar with the fact that there is a wealth of information in one Landsat scene taken now and one taken a year ago that would tell one that a real distribution of the snow pack this year was radically different from the same last year, and that we ought to be thinking about doing something about that.

Now, I can also see where it may well be that if your job with one portion of the system is to predict the consequent melt water based on the kind of data that you've used in the past, and that's point sampling, that you may not even be aware of the existence of Landsat or the processing of those data for that function.

Mr. BROWN. Let me just ask one further question.

You make reference to an improved resolution capability. That's a very sensitive area, of course. Could you give us a clue as to what range we're talking about looking at? For example, the Spot, I think is in the 20-meter resolution or 10-meter resolution. Do you feel that an advanced system for surveying use could be—would it be adequate to have 10 meter resolution or are we looking at 5 or 1, or what?

Dr. LILLESAND. Let me say that one of our experiences with the 80 meter resolution data is that it's OK for such things as large bodies of water; it's OK where we have large wheat fields, but it's dismal where we may have a lot of mixture of vegetation type, such as in the forested areas of the Lake States in this country, where we have small fields. The very limited amount that the community has seen come out of the thematic mapper system, shows that we're going to get a quantum jump when we get to 30. Also, those bands are very narrowly tuned. We've touched it up a lot relative to what we think we're going to be able to do technologically.

I personally am a principal investigator for 2 out of 45 spot simulation sites. I have in hand the data from one in a forestry site in northern Wisconsin. Whereas, we couldn't classify forest vegetation

before, now with 10 meter resolution data we have access to stereo we will not only be able to classify that vegetation, but get at different levels of defoliation due to spruce budworm, for example, which will have direct implications. I think that 30 will knock the socks off of what we've been doing with 80, 20, and 10 we'll get ever so much more. The tradeoff in that is the very radical increase in the data rates and flow, and handling and so forth.

Mr. BROWN. You'll have a system for selecting the data in a very efficient way and not be overwhelmed by data flow.

Dr. LILLESAND. That's right.

Mr. BROWN. Thank you, Dr. Lillesand.

Mr. VOLKMER. The gentleman from Florida.

Mr. MACKAY. Mr. Chairman, I would like to warn you in advance I've got more questions than this hearing can accommodate, so I'm kind of like the witness—the witness has normally got more to say than we've got time to hear.

Mr. VOLKMER. If the gentleman would do like the chairman proposes to do. I have quite a few questions too, and what I'm going to propose is that we submit them in writing to Dr. Lillesand and let him respond.

Mr. MACKAY. I would like to just ask a couple of them because it seems to——

Mr. VOLKMER. I hope not too long. I was supposed to be at a luncheon at 12 o'clock.

Go right ahead.

Mr. MACKAY. It seems to me that Dr. Lillesand has raised an issue that has been troubling a number of us and that is the fundamental question of our research. Who's setting our research priorities in this country and it seems to me that this issue poses that better than anything I've seen. In fact, it seems to me that our research priorities are not being set by somebody who's got a broad view of what the problems of the United States are likely to be. They're being set by advocacy groups and here's a program that has no advocacy group. It has no Government agency whose future depends specifically on it. It has no military implications that they can see yet, and it has no private sector group that sees that if Government will keep subsidizing it they can make a profit. As a result we're dropping it. It seems to me that the French and Japanese have got a process to setting research priorities which is very different from ours and they've come to the opposite conclusion with this program.

It seems to me if we are the oversight committee, the Science and Technology Committee, perhaps not this subcommittee or these subcommittees, but our committee is the oversight committee and the question we ought to be asking is who in the world is setting priorities. I thought NSF was supposed to be that, and I'd be very interested in asking them how in the world this came about. Or if it's not them, I would be interested in finding out do we have a mechanism to set priorities. So that's the question I would like to ask, and you've done a beautiful job, it seems to me, of posing that. It looks like we've got an 18th or 19th century concept of research priorities and we're out here worrying about industrial policies when, in fact, our whole system is being driven by advocacy groups

which means necessarily, when you've got something that's totally new, there's no advocacy group.

Dr. LILLESAND. I concur with what you're saying. I wish I could answer on behalf of everyone involved; NSF and professional societies and everyone else. I think you very definitely have your finger on the problem. They are working on that. I don't know who they are, and we have a whole set of toys being flown in space without a policy for using them. That epitomizes the problem and the loud silence that you're hearing from the Landsat community is because of this lack of direction. On one hand, ironically, there's so many of these potential users that they don't have a concerted voice, but on the other they just don't feel like there's a commitment in the national agenda, from a research standpoint, leading the way that will cascade into applications in day-to-day management. They don't have that sense because we don't have the policy direction in this country. They are indeed correct. Others throughout the world have recognized it. They've got systems on the drawing board. Some have them on the pad, but they're looking for the future and those drawing boards aren't empty. The people that will exist in this world in the future will have to have the information on what's happening around this globe in terms of our resources.

I cannot see this country, at this point, not recognizing that it is not only in our national interest, but the global interest, and in the long-term interest of peace, to be able to maintain the cutting edge in land remote sensing.

Mr. MACKAY. I gather from Mr. Frank's testimony that the Carter administration made the decision about commercialization and ultimate phase out before they got the data which showed the potential of the program, and the Reagan administration has now accelerated that decision and you've got 99 days worth of data that people haven't even yet fully processed that shows the potential to be orders of magnitude greater than anybody thought.

Dr. LILLESAND. I think that in trying to access where the changes in some of these directions might come about, again, let me reiterate that I believe and support the various comments that have been made to me in the past, that the future of space is commercial. No question about it, and I think that refers to the land activity. The question is when.

As I understand the policy under the Carter administration, indeed, it said just that—the future is commercial. But we aren't quite there. We've got to have D prime up through the four D variety satellites and point to evolution any commercialization. Technologically, when you lop off two out of four D variety satellites with no commitment beyond that, you've changed an evolution to a revolution and we aren't ready for it.

Mr. MACKAY. Thank you, Dr. Lillesand.

Mr. VOLKMER. Thank you gentlemen.

If you have additional questions if you will provide them to the staff we'll submit them. At this time I would like to ask unanimous consent to keep the record open for 2 weeks to serve additional pertinent material and answers to those questions. I would like for you to reply as promptly as possible to these.

Dr. LILLESAND. I'll be glad to do that and I want to thank you for the opportunity to testify.

Mr. VOLKMER. Thank you very much for being here. You've helped a great deal in our understanding of the problems in the Landsat data distribution and usage.

At this time the subcommittee stands adjourned.

[Whereupon, at 12:30 the subcommittee was adjourned, subject to the call of the Chair.]

[Questions and answers submitted for the record follow:]

Environmental Remote Sensing Center
Institute for Environmental Studies
UNIVERSITY OF WISCONSIN – MADISON
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August 23, 1983

The Honorable Harold L. Volkmer
Chairman, Subcommittee on Space
Science and Applications
U.S. House of Representatives
Suite 2321 Rayburn House Office Bldg.
Washington, D.C. 20515

Dear Congressman Volkmer:

Enclosed herein are written answers to the questions on remote sensing commercialization forwarded to me in your letter of July 25, 1983. I hope these responses reach you in time for inclusion in the hearing record.

Again, I thank you for the opportunity to testify on this extremely important issue.

Sincerely,

Thomas M. Lillesand

Thomas M. Lillesand
Director

TML:lc

Enclosure

cc: John Palatiello, ASP

Questions for Dr. Lillesand
July 21, 1983

1. You mention the various programs in which the State of Wisconsin currently utilizes LANDSAT data. You say they have all been research programs.

   (a) Are LANDSAT data currently used in <u>any</u> operational State programs, either in Wisconsin or elsewhere?

   As you are probably aware, various studies and inventories have been conducted relative to the operational uses of Landsat data by state and local agencies. While numerous applications are cited in these reports, it is somewhat difficult to interpret such studies given the manner in which their data are collected and the general lack of agreement on a precise definition of the term "operational program." My own experience with state agency users reinforces the conclusion that we are still in a learning and demonstration phase in great part and little day-to-day use is made of the data given the uncertainty about the Landsat program. However, I wish to reiterate the fact that the <u>technical potential</u> for operational use definitely exists. As I indicated in my oral testimony the State of Wisconsin has used Landsat data to monitor the status of eutrophication of its lakes statewide. Accomplishing such a task would be virtually impossible, monetarily and technically, if conventional ground data were the only source of information. Many similarly successful applications have been demonstrated elsewhere, but not on a repeated basis given the current factors of data cost and program uncertainty.

   (b) What is the current investment of the State of Wisconsin in LANDSAT data? Of other States?

   Wisconsin's investment to date in raw Landsat data across the various state agencies has been on the order of $100,000. In addition, various agencies have invested substantial amounts in personnel training and computer processing of the data. Capital equipment investment in our state for processing the data has been focused primarily in the University of Wisconsin-Madison with equipment expenditures on the order of $200,000. Personnel costs to date generally match this figure.

   Prior to coming to the University of Wisconsin, I was on the faculty of the University of Minnesota so I am somewhat familiar with similar expenditures in that state. There, state agency equipment investment to support Landsat processing and geographic data handling has been on the order of $500,000. Data purchases to date have been generally comparable to those in Wisconsin.

(c) How "soft" is the State market for LANDSAT data? If the price of LANDSAT data were increased substantially, what would happen to use of the data by States, localities, and universities?

In my opinion the state, locality, and university market for Landsat data is extremely soft. Prices already in place have severely limited purchases by these entities in our state.

2. Is the State of Wisconsin or other users that you may be aware of planning on buying data from the French SPOT system? What does the country lose in relying on SPOT and other foreign systems for land remote-sensing data?

Our university is currently involved in assessing the utility of French SPOT data in conjunction with a number of state agencies. This is being accomplished through our active participation in the SPOT simulation campaign being conducted by SPOT IMAGE Corporation. Assuming that SPOT data prices are reasonable, we plan on buying substantial amounts of SPOT data in support of those applications where improved spatial resolution is required.

With respect to sole reliance on SPOT sources of land remote sensing data, a number of issues must be considered. First, SPOT is probably best considered a technical supplement to, rather than replacement for, Landsat TM-type data. That is, though the spatial resolution of SPOT is superior, its spectral resolution is not. A second consideration is the long-range implication of foreign control over data cost and access. The greatest concern about reliance on foreign sources, however, would be our country's apparent willingness to pay the extensive front-end costs of developing remote sensing technology and then to relinquish our technological leadership in this area to another nation(s). I would hope, for the benefit of American industry, we could avoid a "Detroit response" to foreign challenges in this area of technology. I believe it is in our best interest over the long term to continue to be the leader in international competition and cooperation in land remote sensing.

3. You recommend that if the land remote-sensing system is commercialized, the Federal government should maintain a large and active presence in research and development. Specifically what would you recommend? That NASA maintain its current, or an enhanced, level of R&D? Would DOD have a lead role to play if land remote-sensing were commercialized (i.e., in terms of long-term R&D)?

I would recommend an enhanced level of R&D within NASA in combination with universities and industry. Relative to DOD's role in long-term R&D, its contributions will probably be substantive, but far from sufficient. The fundamental technical philosophy of design of DOD sensing systems varies greatly from that of resource-oriented systems. For example, DOD systems emphasize the spatial capabilities attendant to the mission of DOD data users. Civil systems emphasize a multispectral capability. More important than such technical differences, however, is the need to establish a strong, broad, and open communication mechanism between users of civil systems and the R and D community. A DOD-only disposition of future R&D simply would not provide the feedback loops critical to the overall success of the design of our future systems.

4. Earlier witnesses have testified that, if land remote sensing were commercialized, it is possible that the vendor would price LANDSAT data at an exorbitant price, expecting to make a profit off of a few wealthy customers who would essentially be buying proprietary data.

   (a) Is this a possible scenario? Is it likely?

   It is certainly a possible scenario. However, I would hope we would formulate a formal policy precluding it.

   (b) How would this effect university research programs? How would it affect state and local government users?

   Most university research programs and state and local governments consider our current pricing structure exorbitant. Further increases would continue to stifle university research, user experience, and prospective commercial opportunities.

5. You suggest strongly that the government should continue to fund land remote-sensing satellites. The problem with this approach, of course, is that these satellites are expensive. LANDSAT D-prime costs $300-350 million. Do you think that the government could build a land remote-sensing satellite with capabilities similar to D-prime for considerably less money? How?

   The rate of technological change in sensor design is great enough that we are in an era where we have almost daily changes in the technical form and economics of sensor system design and fabrication. While certain parameters of Landsat D' could probably be replicated and/or improved upon at reduced cost, a means to provide for a substantial reduction in cost while preserving the overall comparable technical performance of the system is not readily apparent at this time.

6. Dr. Lillesand you refer (page 3) to the "potential" of the user community's employment of Landsat data. Also several places (page 5 and 6) you refer to the need for more research in "understanding what the information content of the data stream is."

   (a) Are these two points related? That is, do we have a stream of information coming down from the satellite which we don't fully utilize because we don't yet know how to utilize it?

   Congressman, you have crystallized the problem precisely. In the Landsat program we've placed much more emphasis on acquiring data than on processing and understanding the information content of the data. Landsat has provided a means to see the earth as never before and we're still developing the technical base and institutional structure necessary to fully exploit the data.

   (b) If this is the case, how will this situation impact or be impacted by commercialization? It would seem on the one hand that a commercial operator might create real users from potential ones through market development efforts. On the other hand such an operator might prefer to concentrate on selling data to a few users (oil companies?) who

know how to use the data and place a high value on it. Please comment.

Marketing alone is not the answer. Marketing efforts must be supported by extensive applications research. Again, we've developed land remote sensing placing our resources much more on data acquisition than on data analysis and use. As with the enhancement necessary in long-term R&D, I believe the time is critical for enhancing support of short-term research in the federal, industrial, and university sectors. For example, broad access and experience with the TM data are important to the marketability of U.S. land remote sensing data collected to date. Commercial marketing without a greater push on our data processing capabilities and support of research on applications will likely fall far short of its objectives.

7. At a recent meeting on land remote sensing the following statement was made:

"In NASA's sphere of operation remote sensing is primarily an aerospace technology. But in the commercial world, remote sensing is a computer and information technology and thus it should be packaged and marketed accordingly."

Do you agree with this?
Would you care to comment?

Again, NASA should not be expected to "package" and "market"--that simply is not its mission. Similarly, industry can't be expected to perform high risk, long-term remote sensing R&D. Right now remote sensing is a data technology, which must evolve into an information technology. NASA, NOAA and other federal agencies, industry, and academia all must play a part in nurturing this basic transformation. No single sector can do the job alone in my estimation.

8. At the same meeting another statement was made about the commercialization process:

"Emphasis should be placed on creating incentives for investment in the next generation of reliable and efficient satellite sensing systems, rather than on unloading the product of past R&D programs."

Do you agree?
Would you care to comment?

If Landsat D' (once proven operational) is the product being unloaded, as a taxpayer I certainly want to see it provide some fruit for our past investment in this system. I feel it is desirable both from a scientific and marketing standpoint that we learn what we can from TM data now and let that knowledge and experience create the incentives for investment in next generation systems. We simply have too much invested in, and too much to learn from, our current R&D systems to abandon them prematurely.

THE COMMERCIALIZATION OF METEOROLOGICAL AND LAND REMOTE-SENSING SATELLITES

TUESDAY, NOVEMBER 8, 1983

HOUSE OF REPRESENTATIVES, COMMITTEE ON SCIENCE AND TECHNOLOGY, SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT, AND SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS,

Washington, D.C.

The subcommittees met, pursuant to call, at 9:30 a.m., in room 2318, Rayburn House Office Building, Hon. Harold L. Volkmer (chairman of the Subcommittee on Space Science and Applications) presiding.

Mr. VOLKMER. The Subcommittee on Space Science and Applications and the Subcommittee on Natural Resources, Agriculture Research and Environment will come to order.

Today's session opens 2 days of joint hearings on a draft bill, the Land Remote-Sensing Commercialization Act of 1983. The draft on which we will take testimony is dated October 26, 1983, and copies are available from the subcommittee offices. Based on the testimony we hear, a revised bill may be introduced in the future.

Chairman Scheuer has to be in New York today for the elections there, but will be chairing tomorrow's session.

The Committee on Science and Technology has generally supported commercialization of space technologies when that is in the national interest. This bill would guide and encourage such commercialization. The bill would set the policies, procedures, conditions and limitations that were envisioned in the Bateman amendment to this year's NASA authorization bill.

I might mention that we are aware of the activities of the Source Evaluation Board of the Department of Commerce. Chairman Scheuer and I have written to Secretary Baldrige expressing our suggestions and reviews in regard to some specific areas of the RFP.

A truly commercial operation would be driven by its customers. We have tried to write a bill that would leave commercial decisions up to the commercial operator. For example, we do not specify what technologies should be used.

But we do provide a clear legal framework for the operator. For example, under the bill:

The operator must satisfy national security concerns;

He must sell data on a nondiscriminatory basis to all users, thus continuing our traditional "open skies" policy; and

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He must provide reasonable assurance of data continuity from the point of view of the data user.

It is important to repeat that "data continuity" is defined in terms of users or customers and that the bill would not specify that any particular technology be flown or not flown.

Finally, let me acknowledge that there may be other interested parties who would care to submit statements for consideration for inclusion in the record. We would be happy to receive such proposed statements at the subcommittee offices.

[The committee print, dated October 26, 1983, follows:]

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[C O M M I T T E E P R I N T]

October 26, 1983

98TH CONGRESS
1ST SESSION

H. R. _____

IN THE HOUSE OF REPRESENTATIVES

Mr. _____ introduced the following bill; which was referred to the Committee on _____

A BILL

To establish a system to promote the use of land remote-sensing satellite data, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

That this Act may be cited as the ''Land Remote-Sensing Commercialization Act of 1983''.

TITLE I--DECLARATION OF FINDINGS, PURPOSES, AND POLICIES

FINDINGS

SEC. 101. The Congress finds and declares that--

(1) the continuous collection and utilization of civil remote-sensing data from satellites is of major benefit in managing the Earth's natural resources;

(2) a vigorous, private sector involvement in space is often appropriate and can provide a sound basis for future growth of space-based technologies;

(3) there is a need to determine the extent to which it is appropriate and in the national interest for the private sector to assume full responsibility for land remote-sensing;

(4) United States land remote-sensing involves international commitments;

(5) United States land remote-sensing involves legitimate national security concerns;

(6) to fully utilize the strengths of the private sector, any process of commercialization of land remote-sensing should involve maximum competition and minimum subsidy;

(7) it is in the national interest of the United States to maintain international leadership in civil

remote-sensing technology and to promote profitable land remote-sensing ventures;

(8) land remote-sensing development has been inhibited by lack of market development, and private industry is best suited to develop these markets;

(9) at the present time it is unclear that the private sector alone will develop a total land remote-sensing system because of the high risk and large capital expenditures involved;

(10) cooperation of government and industry is required to guarantee both a United States' capability and data continuity in land remote-sensing;

(11) such cooperation should be structured to minimize both the amount of government support and the degree of government regulation;

(12) the time is appropriate to encourage cooperation of government and industry to guarantee the viability of the United States' land remote-sensing capability; and

(13) there is no compelling reason to commercialize meteorological satellites at this time.

PURPOSES

SEC. 102. It is therefore the purpose of this Act--

(1) to guide the United States Government in achieving full, prompt, and proper involvement of the

private sector in civil land remote-sensing from space;

(2) to preserve the United States' leading position in civil remote-sensing, to preserve its national security, and to fulfill its international obligations;

(3) to prescribe conditions for assuring continuity of remote-sensing data while protecting public and private non-discriminatory access to these data;

(4) to minimize the duration and amount of any further Federal investment that might be necessary to achieve full commercialization of civil remote-sensing; and

(5) to prohibit commercialization of meteorological satellites at this time.

POLICIES

SEC. 103. (a) It shall be the policy of the United States to preserve its right to acquire and disseminate digital remote-sensing data, provided that such data are made available to all potential users on a non-discriminatory basis.

(b) It shall be the policy of the United States both to commercialize those space remote-sensing functions that properly lend themselves to private sector operation and to avoid competition by the Government with such commercial operations, while continuing to preserve our national security, to honor our international obligations, and to

retain in the Government those remote-sensing functions that are essentially of a public service nature.

DEFINITIONS

SEC. 104. For purposes of this Act--

(1) The term ''digital remote-sensing data'' means the unprocessed and minimally processed signals collected from civilian remote-sensing satellites. Such minimal processing shall be limited to rectification of instrumental distortions, registration with respect to features on the Earth, and calibration of spectral response. Such term does not include conclusions, manipulations, or calculations derived from such signals or combination of the signals with other data or information. Unless otherwise limited, digital remote-sensing data includes land and ocean sensed data.

(2) The term ''Secretary'' means the Secretary of Commerce.

(3) The term ''on a non-discriminatory basis'' means without preference, bias, or any other special financial, delivery, or technical arrangement which would favor one buyer or class of buyers over another.

(4) The term ''Landsat system'' means Landsat 1, 2, 3, 4, and D-prime, and related ground equipment, systems, and facilities, and any successor land remote-sensing satellites launched prior to the commencement of

the six-year period covered by the contract under section 302.

TITLE II--CONTRACT FOR OPERATION OF EXISTING LAND REMOTE-SENSING SATELLITE SYSTEM

CONTRACTING FOR OPERATION

SEC. 201. (a) In accordance with the requirements of this title, the Secretary may, subject to the availability of appropriations therefor, contract with a United States private sector party or parties to operate the Landsat system and to market digital remote-sensing data generated by such system, including archived data.

(b) The Secretary shall have no authority to enter into any contract for the purpose of making digital remote-sensing data commercially available unless such contract is entered into in accordance with this Act.

(c) A contract awarded under the authority of subsection (a) shall be awarded competitively in accordance with the conditions of section 203. Each such contract shall be of such limited duration as may be necessary to permit the contract to be reawarded periodically and competitively in accordance with such conditions.

(d) No provision of this title shall be construed to permit the transfer to any contractor of title to any part or all of the Landsat system.

SALE OF DATA

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SEC. 202. (a) Any contract entered into pursuant to section 201 shall provide (1) that the contractor will offer to sell copies of the original digital remote-sensing data on a non-discriminatory basis, and (2) that the contractor will make publicly available the terms and conditions upon which it will sell such data.

(b) If the contractor desires to sell information products obtained by processing of the digital remote-sensing data, such business shall be carried out in a manner which prevents the contractor from having a competitive advantage over other firms engaged or proposing to engage in such data processing. The contract shall therefore specify in part that:

(1) such processing business shall be carried on through an organizationally separate unit;

(2) such unit shall pay for the digital remote-sensing data on a non-discriminatory basis; and

(3) in addition, such unit shall not be given favored access to data, such as early receipt of data, special formating of the data, early notice of format changes, favorable reproduction terms, or other similar advantages.

(c) No provision of this section shall exempt the contractor from any other provision of law.

CONDITIONS OF COMPETITION FOR CONTRACT

SEC. 203. (a) The Secretary of Commerce shall, as part of his advertisement for the competition for the contract authorized by section 201, identify and publish international obligations, national security concerns (with appropriate protection of sensitive information), domestic legal considerations, and any other standards or conditions which a private contractor shall be required to meet. In addition, the Secretary shall publish his criteria for determining the practical demise of the space segment of the Landsat system.

(b) The Secretary shall select the contractor on the basis of--

(1) the best financial return to the Government, including payment of royalties on data sales and the ability to operate the system at a saving to the Government;

(2) ability to meet the obligations, concerns, standards, and conditions identified under subsection (a);

(3) technical competence, including the ability to assure continuity of data;

(4) ability to market aggressively digital remote-sensing data;

(5) absence of any conflicts-of-interest which could inhibit non-discriminatory access to such data; and

(6) ability to effect a smooth transition with the contractor selected under title III of this Act.

FOREIGN GROUND STATIONS

SEC. 204. The contract shall provide for continued supply of digital remote-sensing data to foreign ground stations for the life, and according to the terms, of those agreements between the United States Government and such foreign ground stations that are in force on the date of enactment of this Act. Upon the expiration of such agreements, or in the case of foreign ground stations that have no agreement with the United States on such date of enactment, the contract shall provide for the contractor to make digital remote-sensing data available to foreign users on a non-discriminatory basis.

TITLE III--PROVISION OF DATA CONTINUITY DURING TRANSITION PERIOD

PURPOSES AND DEFINITIONS

SEC. 301. (a) It is the purpose of this title--

(1) to provide for a transition between Government operation and fully private, commercial operation of land remote-sensing satellite systems;

(2) to determine, in an orderly manner and with minimal risk during the transition period, whether fully private operation of land remote-sensing is in the best interest of the Nation; and

(3) to provide for the effective continuity of MSS data for six years after the practical demise of the space segment of the Landsat system.

(b) For purposes of this title--

(1) the term ''Multi-Spectral Scanner'' means the instrument popularly referred to by that name and carried on the Landsat 4 and Landsat D-prime satellites; and

(2) the term ''MSS data'' means digital remote-sensing data which, from the point of view of a data user, are--

(A) functionally equivalent to data from the Multi-Spectral Scanner; and

(B) fully compatible with data, and equipment used to process data, from such Scanner.

CONTRACT FOR DATA AVAILABILITY AND CONTINUITY

SEC. 302. (a) The Secretary shall, subject to the availability of appropriations therefor and subject to the licensing conditions established under title IV, contract with a United States private sector party or parties, by means of an open, competitive process, for the provision by such party or parties of the capability of generating MSS data and selling and delivering such data to the Federal Government. The capability shall include, at a minimum, the capability to generate and deliver MSS data at the annual

volume and rate of Federal usage during fiscal year 1983, as determined by the Secretary. The capability may be provided by the contractor using whatever technologies the contractor may select. The contractor, at his option and cost, may make available data of a higher quantity than is required or of a higher quality than MSS data.

(b) The contract authorized by subsection (a) shall provide--

(1) for a prepayment by the Government to cover a portion of the capital cost of providing such capability, which may be paid in installments (A) based on progress prior to the beginning of the 6-year period of data delivery described in subsection (c), and (B) the sum of which shall be less than the total initial cost of the system; and

(2) that sale of digital remote-sensing data shall be in accordance with the provisions of section 303 of this title.

(c) The Secretary shall contract for the capability to generate and deliver MSS data beginning at an appropriate date that is determined by the time necessary to build and launch the necessary equipment and to obtain a license therefor under title IV, the projected practical demise of the space segment of the Landsat system, the need for data, total costs, and such other factors as he deems appropriate.

The contract shall provide for reasonable assurance of continuing the capability of generating and delivering MSS data for six years.

(d) The Secretary may allow the contractor to buy or otherwise acquire the use of surplus equipment of the Landsat system. Officials of other Federal civilian agencies are authorized and encouraged to cooperate with the Secretary in carrying out this subsection.

(e) The Secretary is authorized to provide for the capability by licensing a private sector party or parties in accordance with title IV of this Act to utilize (on a space-available basis) civilian government satellites as platforms for a civil remote-sensing satellite system, if the private sector party or parties immediately reimburses the Government for all related costs incurred with respect to such utilization, including a reasonable, proportionate share of fixed, spacecraft, data transmission, and launch costs.

(f) The contract shall be awarded on the basis of:

(1) the one-time cost of providing the capability;

(2) the royalty offered to the Federal Government on data sales;

(3) ability to meet the conditions for obtaining a license under title IV;

(4) the reliability, technical competence, and

financial condition of the contractor;

(5) the ability of the contractor to provide digital remote-sensing data on a timely, continuous, and reliable basis;

(6) the contractor's ability to develop the remote-sensing data market;

(7) the ability to effect a smooth transition with any contractor selected under title II; and

(8) the contractor's ability to supplement basic capabilities specified in section 302(a) by adding remote-sensing capabilities (at the contractor's expense) which maintain the United States' leadership in remote-sensing.

(g) If, as a result of the competitive process required by subsection (a), the Secretary receives no bid which he finds acceptable under the conditions of this Act, the Secretary shall so certify to the Congress. Thirty days after so certifying, the Secretary may reopen the competition. If no acceptable bids are received after such subsequent competition, or if the Secretary decides not to reopen the competition, the Secretary shall so certify to the Congress. Ninety days after so certifying, the Secretary may proceed to assure MSS data continuity by procurement and operation of the necessary systems, subject to the availability of appropriations therefor. Such procurement

and operation may include generation of data of a higher quality than MSS data.

SALE OF DATA

SEC. 303. (a) Any contract entered into pursuant to section 302 shall provide (1) that the contractor will offer to sell copies of the original digital remote-sensing data on a non-discriminatory basis, and (2) that the contractor will make publicly available the terms and conditions upon which it will sell such data.

(b) Any sale of digital remote-sensing data to Federal agencies shall be on a non-discriminatory basis, but at least 5 percent of the price of each sale shall be rebated to the Government (and thereby reduce the total net cost to the Government) as a royalty payment to the United States Treasury. Data sales to non-Federal buyers shall not be subject to such a rebate.

(c) If the contractor desires to sell information products obtained by processing of the digital remote-sensing data, such business shall be carried out in a manner which prevents the contractor from having a competitive advantage over other firms engaged or proposing to engage in such data processing. The contract shall therefore specify in part that:

(1) such processing business shall be carried on through an organizationally separate unit;

(2) such unit shall pay for the digital remote-sensing data on a non-discriminatory basis; and

(3) in addition, such unit shall not be given favored access to data, such as early receipt of data, special formating of the data, early notice of format changes, favorable reproduction terms, or other similar advantages.

(d) No provision of this section shall exempt the contractor from any other provision of law.

REPORT

SEC. 304. Two years after the date of the commencement of the 6-year period covered by the contract under section 302(c), the Secretary of Commerce shall report to the President and to the Congress on the progress of the transition to fully private financing, ownership, and operation of the remote-sensing satellite system, together with any recommendations for action.

TITLE IV--LICENSING OF PRIVATE REMOTE-SENSING SATELLITE SYSTEMS

GENERAL AUTHORITY

SEC. 401. The Secretary of Commerce is authorized and required, in consultation with other appropriate Federal agencies, to license qualified private sector party or parties, consortia of private sector parties, or consortia of private sector parties and Government agencies to operate

civil remote-sensing satellite systems in accordance with the provisions of this title.

CONDITIONS FOR OPERATION

SEC. 402. (a) No party or consortium may operate any remote-sensing satellite system which is subject to the jurisdiction or control of the United States without a license pursuant to section 401.

(b) A party or consortium shall be licensed to operate its system subject to the following conditions:

(1) The system shall be operated in such manner as to preserve and promote the national security of the United States and to observe and implement the international obligations of the United States.

(2) Digital remote-sensing data shall be made available to all potential users on a non-discriminatory basis.

(3) In the case of a consortium, the system shall be administered by a central, responsible entity established by the consortium for that purpose.

(4) No license issued under this title shall protect the license holder from fair competition from other license holders.

(5) Before any party or consortium terminates its operations under the license, it shall make disposition of any satellites in space in a manner satisfactory to

the President.

(6) Any party or consortium proposing to be licensed under section 401 shall agree, as a condition for the receipt of such license, to provide to the Secretary any data generated under such license which the Secretary may request for the purpose of archiving pursuant to section 602.

AGENCY ROLES

SEC. 403. (a) The Secretary shall offer his offices for assistance in the formation of consortia under this title.

(b) Federal agencies are authorized and encouraged to conduct joint ventures in satellite remote-sensing systems by forming consortia with private firms in accordance with the provisions of section 401 of this Act, if--

(1) such activities are appropriate to the agencies' mission;

(2) appropriated funds are available for that purpose; and

(3) such activities will not compete with United States private sector activities.

TERMINATION

SEC. 405. If, at the expiration of ten years after the date of enactment of this Act, no firm or consortium has been licensed and continued in operation under the provisions of this title, the authority of this title shall

terminate.

TITLE V--RESEARCH AND DEVELOPMENT

CONTINUED FEDERAL RESEARCH AND DEVELOPMENT

SEC. 501. The Administrator of the National Aeronautics and Space Administration, the Administrator of the National Oceanic and Atmospheric Administration, and the heads of other Federal agencies are directed to continue remote-sensing research and development and are encouraged to conduct experimental space remote-sensing programs (including applications programs) and to develop remote-sensing technologies in support of their authorized missions, using funds appropriated for those purposes. In carrying out such programs Federal agencies are authorized and encouraged to cooperate with private industry.

USE OF EXPERIMENTAL DATA

SEC. 502. Data gathered in Federal experimental space remote-sensing programs may be used in related research and development programs funded by the Federal Government, including applications programs, but not for commercial uses or in competition with private sector activities, except as permitted by section 503.

SALE OF EXPERIMENTAL DATA

SEC. 503. (a) Data gathered in Federal experimental space remote-sensing programs may be competitively sold en bloc (consistent with national security interests and

international obligations of the United States) to any United States entity which will market the data on a non-discriminatory basis.

(b) The entity shall pay to the United States Treasury a royalty of at least 5 percent of the sale price for all data sold to the Federal Government.

TITLE VI--GENERAL PROVISIONS

''OPEN SKIES''

SEC. 601. (a) Satellite digital remote-sensing data generated by any system operator under the provisions of this Act shall be made available to all users on a non-discriminatory basis in accordance with the requirements of this Act.

(b) For the purposes of this title, the term ''system operator'' means a contractor under title II or III or a license holder under title IV.

ARCHIVING OF DATA

SEC. 602. (a). In order to preserve many of the public benefits of civil remote-sensing from space, including long-term global environmental monitoring, the Secretary shall provide both for long-term storage and maintenance of data as described in subsection (b) and for access to those data.

(b)(1) The Secretary shall provide storage, maintenance, and access for digital remote-sensing data from the Landsat

system.

(2) The Secretary shall provide storage, maintenance, and access for digital remote-sensing data generated pursuant to title III.

(3) The Secretary may provide storage, maintenance, and access for digital remote-sensing data generated by license holders under title IV if the Secretary finds that such data have sufficient immediate or potential public benefit.

(c) Original data or copies thereof shall be promptly made available to the Secretary by the system operator in a form suitable for processing for data storage, maintenance, and access. The Secretary is authorized (subject to the availability of appropriations) to pay to such system operator reasonable costs for reproduction and transmittal of the data.

(d)(1) Copies of stored data may not be made available from the archive except (A) to the system operator originally providing the data, or (B) pursuant to paragraph (2) or (3) of this subsection.

(2) Copies of stored data may be made available to persons requesting them if the system operator originally providing the data so authorizes the Secretary in writing.

(3) Copies of stored data may be made available to persons requesting them without authorization of the system operator after 15 years after the date of the generation of

the data.

(4) Persons or system operators requesting and receiving copies of the data from the archive shall pay to the Secretary reasonable costs of reproduction and transmittal.

(5) Nothing in this subsection shall release the Secretary from his obligation to provide data storage, maintenance, and access.

(e) In carrying out the functions of this section, the Secretary may use existing facilities or he may contract with a private sector party or parties for the performance of such functions, subject to the availability of appropriations therefor.

NONREPRODUCTION

SEC. 603. Satellite digital remote-sensing data generated by any system operator under the provisions of this Act may be sold under the condition that such data shall not be reproduced and disseminated by the purchaser.

REGULATIONS

SEC. 604. The Secretary may promulgate regulations for the implementation of the provisions of this Act.

REIMBURSEMENT FOR ASSISTANCE

SEC. 605. The Administrator of the National Aeronautics and Space Administration, the Secretary of Defense, and the heads of other Federal agencies are authorized to provide assistance to operators of remote-sensing systems under the

provisions of this Act. Substantial assistance, such as launch services, shall be reimbursed by the operator.

PENALTIES AND REMEDIES

SEC. 606. Licenses issued by the Secretary under the provisions of this Act may provide for penalties and remedies for noncompliance with the terms of the license in order to preserve and protect the interests of the United States.

RADIO FREQUENCY ALLOCATION

SEC. 607. The Federal Communications Commission is authorized and encouraged to allocate to any license holder under title IV of this Act access to Government radio frequencies and other civil radio frequencies appropriate for space remote-sensing systems in a timely manner consistent with the national interest.

CONSULTATION

SEC. 608. (a) The Secretary shall consult with the Secretary of Defense on all matters under this Act affecting national security. The Secretary of Defense shall be responsible for identifying and notifying the Secretary of those national security concerns of the United States which are relevant to activities under this Act.

(b) The Secretary shall consult with the Secretary of State on all international matters. The Secretary of State shall be responsible for identifying and notifying the

Secretary of those international obligations and commitments of the United States which are relevant to activities under this Act.

(c)(1) The Secretary is authorized to make determinations as to the appropriateness and reasonableness of conditions based on national security or international obligations which may be imposed on license holders by other Federal agencies.

(2) If, as a result of conditions imposed on a contractor on the basis of national security or international obligations, the Secretary determines that additional costs will be incurred by the contractor, the Secretary may require the agency or agenices requesting such conditions to reimburse the contractor for such costs.

TITLE VII--PROHIBITION OF COMMERCIALIZATION OF WEATHER SATELLITES

PROHIBITION

SEC. 701. Neither the President nor any other official of the Government shall make any effort to lease, sell, or transfer to the private sector, commercialize, or otherwise dismantle any portion of the weather satellite systems operated by the Department of Commerce or any successor agency.

FUTURE CONSIDERATIONS

SEC. 702. Regardless of any change in circumstances

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subsequent to the enactment of this Act, even if such change makes it appear to be in the national interest to commercialize weather satellites, neither the President nor any official shall make any effort to commercialize weather satellites unless this title has first been repealed.

Mr. VOLKMER. At this time, I will recognize the—Mr. McGrath, for an opening statement.

Mr. MCGRATH. Thank you, Mr. Chairman. I want to join you in welcoming our witnesses here today to testify on this draft bill, which provides a procedure for the transition of our civil remote-sensing system to the private sector.

I have reviewed this bill and find the approach similar to one which we have heard testimony about several times before. While I think it is a workable approach, I believe we should defer markup on such a bill until the RFP process currently under way has been completed.

It may very well be that this is exactly the approach that we will need to adopt, however, we will have a great more—a great deal more—information after the responses to the RFP have been received.

Nevertheless, the issues that we would be dealing with at the culmination of the RFP process, when we have such a legislative proposal from the Department of Commerce, are the same issues we would need to address in considering this draft legislation. Therefore, it is appropriate for us to hear the input from today's witnesses on these issues.

Thank you.

Mr. VOLKMER. Thank the gentleman.

Our first witness today will be Mr. Peter Thacher, of World Resources Institute. Mr. Thacher, would you please take a chair at the table.

Your statement will be made a part of the record in full. You may review it in total or you may summarize it, however you so desire. Mr. Thacher.

STATEMENT OF PETER S. THACHER, WORLD RESOURCES INSTITUTE

Mr. THACHER. Thank you, Mr. Chairman.

My statement will be very brief and it rests on my experience until June of this year when I retired as the Deputy Executive Director of the United Nations Environment Plan, a global environment and resource agency at its headquarters in Nairobi.

Beginning in 1958, I was a U.S. State Department official dealing with U.S. initiatives in the field of outer space, particularly with regard to practical benefits from space. On the basis of my own ex-

perience, the draft bill before you goes, I believe, a long way to meeting the international need for continuity of MSS and other digital remote sensing data to remain available to all potential users on a nondiscriminatory basis.

However, there is growing uncertainty about the U.S. policy, which I believe requires the earliest decision because otherwise, those who are carrying out work now based on Landsat data will look to other suppliers, specifically to the upcoming and well-advertised French SPOT program throughout the developing world, as well as to Japan, who have plans on the boards, and in this uncertainty, they will either adjust or they will delay developing analytical techniques that are appropriate for the use of this data.

This uncertainty is, I regret to say, heightened by awareness of the difficulties on the satellite now in orbit and by a broad knowledge that no provision has been made in the event that launch or other difficulties arise for the only vehicle that is available to maintain continuity, namely Landsat D'.

Second, there are widespread reports that commercialization may result in data being priced beyond the reach of many countries unless aid were given by the U.S. AID agency with which to enable the purchase of data, and this is a further stimulation of uncertainty about continuity, which I believe works to the disadvantage of the United States.

My concerns are not so much with the use of data for assessment of nonrenewable resources, especially in the fuel, natural gas and mineral sector, since a market, I believe, already exists for remote sensing data which, with sophisticated analysis, yields results of a proprietary nature whose benefits outweigh the costs.

Rather, my conern is for the data which with less sophisticated analysis yields insight about renewable resources, which I fear may never be commercially attractive, and therefore may be gradually dropped in a commercial system.

This would work to the disadvantage of national and international organizations which are today learning to use this data to improve land-use planning and other actions to halt the loss of arable soil, destruction of vegetation, including tropical forest cover, genetic diversity, and a host of other elements key to the life-support systems of this planet.

Many of you may know of the World Conservation Strategy, which has been accepted by all of the Governments of the world as policy guidelines, but there are many other such guidelines more specific, such as the World Soils Policy, whose implementation will depend on widespread availability of consistent remote-sensing data.

Additionally, and directly responsive to concerns that were recently reported here, both by EPA and separately by the National Academy of Sciences concerning climate change from the "greenhouse" effect, the U.N. Environment program, through its GEMS [Global Environment Monitoring System] program, together with UNESCO and the Swiss Federal Institute of Technology, are building a world glacier inventory based on work in some 750 glacier stations in 21 countries. The work is completed—is scheduled for completion in 1985 when a computerized data bank will serve as a

baseline against which future changes in glacier masses due to climate change can be assessed.

Future monitoring of the glaciers will rely heavily on satellite data-sensing techniques from which previously unknown glaciers have already been located in inaccessible regions. It is difficult to put a pricetag on the value of data for this purpose, nor should it, I believe, be necessary.

I believe the policy laid down by the Congress in 1958, "that activities in space should be devoted to peaceful purposes for the benefit of all mankind" is correct and should be maintained. Further, that the United States should continue to observe the international commitment that it undertook in article 1 of the 1967 Outer Space Treaty that the use of outer space "shall be carried out for the benefit and in the interest of all countries, irrespective of their degree of economic or scientific development."

These undertakings need not call for sacrifice, even of commercial advantage, since the provision of remote-sensing data, at a price that makes it broadly available, accompanied by training and other technical assistance in its use, creates demands for equipment and processes which have been developed further in this country than in any other.

In a broader sense, Mr. Chairman, it is, I believe, in the U.S. national interest to assist other countries to manage their natural resources on a sustainable basis. Remote-sensing data is a key input to achieve sustainable development. Various international cooperative programs are under way under UNEP sponsorship which rely on inexpensive data to assist Governments to understand changes that are are underway, as well as what needs to be done in order, for example, to reduce loss of arable soil or measure the rate of deforestation.

Studies such as the one by the United Nations Food and Agriculture Organization on "Land, Food and Population," which Governments will be considering this month in Rome, depend very largely on analysis of Landsat data. Early-warning programs are already operational with regard to meteorological events, but Landsat data will increasingly be useful, even if offering no commercial return, in preventing what are termed "manmade natural disasters," such as has caused many to flee their homes for lack of food.

Thanks largely to a combination of remote-sensing data and arduous work on the ground under jungle canopies, an assessment of tropical forests in 76 states has identified countries where present trends will soon lead to total exhaustion. Given the fact that half the forest cover in Haiti has disappeared in the last 30 years, and the rest will go soon, the plight of boat people seeking refuge in Florida should not surprise us.

The prognosis for El Salvador is no better, but with higher priority on trees instead of tanks, steps might still be possible to prevent the falling dominoes of deforestation, soil erosion, flooding, and loss of agricultural productivity which otherwise threatens social, economic, and political stability, sometimes even, as we have seen, U.S. security interests.

It is hard to know how to go about developing a market to meet these needs, but it would be in the U.S. interest to maintain continuity of data which is demonstrably usable by those who need it

most. For it is clear that the living resources of this planet are being destroyed, not so much here in the lands of affluence, but in the developing countries, almost a separate world where ignorance and poverty are the source of unmanaged destruction.

I thank you, sir.

[The prepared statement of Mr. Thacher follows:]

Sy 312041-2

November 8, 1983

TESTIMONY

PETER S. THACHER

WORLD RESOURCES INSTITUTE

1. On the basis of previous experiences as Deputy Executive Director, UN Environment Program (returned June, 1983); Program Director Stockholm Human Environment Conference, June, 1972; and former U.S. State Department officer dealing with Outer Space and related matters since 1958:

2. Draft bill of 26 October goes a long way to meeting the international need for continuity of MSS and other digital remote-sensing data to remain available to all potential users on a non-discrminatory basis, but:

2.1 growing uncertainty about U.S. policy requires earliest decision; otherwise those carrying out work based on Landsat data will look to other suppliers (France and Japan) and adjust, or delay developing analytical techniques appropriate for this data. This uncertainty is heightened by awareness of difficulties on the satellite now in orbit and knowledge that no provision has been made in case of launch or other problems for the only available vehicle to maintain continuity; Landsat D'.

2.2 Widespread reports that "commercialization" may result in data being priced beyond the reach of many countries (unless US AID is given funds with which to enable its purchase) is further stimulating uncertainty about continuity which works to US disadvantage.

3. My concerns are not so much with the use of data for assessment of non-renewable resources, especially fuel, natural gas and minerals, since a market already exists for remote sensing data which, with sophisticated analysis yields results of a proprietary nature whose benefits outweigh the costs.

4. Rather, it is data which, with less sophisticated analysis, yields insight about "renewable" resources which I fear, may never be commercially attractive and, therefore, may gradually be dropped in a commercial system. This would work to the disadvantage of national and international organizations which are today learning to use this data to improve land-use planning and other actions to halt the loss of arable soil, destruction of vegatation including tropical forest cover, genetic diversity, and a host of other elements key to the life-support systems of this planet. Many of you may know of the World Conservation Strategy, but there are many other guidelines, such as the World Soils Policy whose implementation will depend on widespread availability of consistent remote-sensing data.

5. Additionally, and directly responsive to concerns recently reported by EPA and the National Academy of Sciences concerning climate change from the "greenhouse" effect, UNEP, through its GEMS program, together with UNESCO and the Swiss Federal Institute of Technology are building a world Glacier Inventory based on work in 750 glacier stations in 21 countries. The work is scheduled for completion in 1985, when a computerized data bank will serve as a baseline against which future changes in glacier masses due to climatic change can be assessed. Future

monitoring of the glaciers will rely heavily on satellite remote sensing techniques, from which previously unknown glaciers have already been located in inaccessible regions. It is difficult to put a pricetag on the value of data for this purpose. Nor should it be necessary.

6. I believe the policy laid down by Congress in 1958, "that activities in space should be devoted to peaceful purposes for the benefit of all mankind" is correct and should be maintained; further, that the U.S. should continue to observe the international commitment in Article 1 of the 1967 Outer Space Treaty that the use of outer space "shall be carried out for the benefit and in the interest of all countries, irrespective of their degree of economic or scientific development." These understakings need not call for sacrifice, even of commercial advantage, since the provision of remote-sensing data, at a price that makes it broadly available, accompanied by training and other technical assistance in its use, creates demands for equipment and processes which have been developed further in this country than in any other.

7. In a broader sense it is, I believe, in the U.S. national interest to assist other countries to manage their own natural resources on a sustainable basis. Remote sensing data is a key input to achieve sustainable development. Various international cooperative programs are underway under UNEP sponsorship which rely on inexpensive data to assist governments to understand changes that are underway as well as what needs to be done in order, for example, to reduce the loss of arable land, or mea-

sure the rate of deforestation. Studies, such as one by the UN Food and Agriculture Organization on "Land, Food and Population" which governments will be considering later this month in Rome, depend largely on analysis of Landsat data. Early-warning programs are already operational with regard to meteorological events, but Landsat data will increasingly be useful, even if offering no commercial return, in preventing "manmade natural disasters" such as has caused many to flee their homes for lack of food.

8. Thanks largely to a combination of remote-sensing data and arduous work on the ground under jungle canopies, an assessment of tropical forests in 76 states has identified countries where present trends will soon lead to total exhaustion. Given the fact that half of the forest cover of Haiti has disappeared in the last 30 years and the rest will go soon, the plight of boat people seeking refuge in Florida should not surprise us. The prognosis for El Salvador is no better, but with higher priority on trees instead of tanks steps might still be possible to prevent the falling dominoes of deforestation, soil erosion, flooding and loss of agricultural productivity which otherwise threatens social, economic and political stability, sometimes even U.S. security interests. It is hard to know how to go about "developing a market" to meet these needs, but it would be in the U.S. interest to maintain continuity of data which is demonstrably-useable by those who need it the most. For it is clear that the living resources of this planet are being destroyed not so much here, in the lands of affluence, but in the developing countries, almost a separate world, where ignorance and poverty are the source of unmanaged destruction.

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Mr. VOLKMER. Thank you very much, Mr. Thacher. Have you any questions?

The gentleman from California have any questions for Mr. Thacher?

Mr. BROWN. Let me explore just one item with you. I—I find myself in substantial agreement with you as to the importance of the remote-sensing operation to the world resource problems, but what I'm primarily concerned with is the institutional arrangement under which that kind of data could be provided and we're talking about private commercialization here of the remote-sensing system.

As—one alternative to this might be the operation of such a system by an international body. I think of the Intelsat example in the communications field, which operates the international system or a good part of it. I think of some of the operations of the World Meteorological Organization.

Could you comment on whether you think this is either a feasible or a desirable way to go in terms of some part or all of a global earth resources observation system.

Mr. THACHER. Yes, sir; I would say that it is a desirable in the long term, but not feasible in the short term. There is a proposal being considered by the General Assembly of the United Nations, I believe this month, for the establishment of an international satellite monitoring agency. That is an operation which is focused primarily on international observation of arms control and disarmament agreements.

If that were found to be feasible, it would thereafter, of course, be an easy process to embrace the kind of data that would serve the needs of resource survey, but the feasibility of this proposal is, I think, questionable at the moment.

Mr. BROWN. Why wouldn't you put it the other way around? A good global environmental monitoring system would probably pick up all the data necessary for a good peacekeeping system and would have a lot more practical applications in terms of the development process. This is not to belittle the importance of peacekeeping, but the problem with setting up an organization focused solely on peacekeeping is that it is subject to political opposition from a number of sources and will probably not get off the ground because of that; whereas the same or even fewer resources devoted to a true global environmental monitoring system might gain substantial political support from all of the contending forces in the United Nations.

Mr. THACHER. I agree entirely, sir. I think it is a question of political will. There may be technical questions about the resolution of the system, but certainly if the space powers, including the United States, saw it in their interest to propose such a system, the shared cost of launch and operation would be manageable. I think that the financial problems of the United Nations system are known and make this a difficult option to contemplate at the present.

Mr. BROWN. Well, the—the odd thing about a Landsat system, a global Earth-observating system is that it is just as cheap to look at the whole globe as it is to any one part of it and it's obviously

rational and cost-effective to do it as a global system, share the costs on a global basis.

Mr. THACHER. I think that's been demonstrated repeatedly, sir.

Mr. BROWN. Thank you, Mr. Chairman.

Mr. VOLKMER. Thank you. The gentleman from Virginia—oh, wait a minute, excuse me, the gentleman from New Mexico.

Mr. LUJAN. Thank you, Mr. Chairman.

As I envision this thing moving—moving along is in steps and I guess the legislation provides for that. We're looking, perhaps, at starting off with marketing, which the expertise exists already in—in commercial companies. I suppose that's—that's the logical step and then later on, we move in steps to when the entire system becomes—becomes commercial.

The intent is that user needs is what would drive the technology. You think that's efficient to drive advances in technology?

Mr. THACHER. It's—I suppose in a commercial system, I would speculate that user needs, unless they can pay the bills, will not drive the system. In the present arrangements, where the data is the result of active ongoing research and development, the users at both the international level, agencies such as the food and agricultural organization, and at the national level, the various planning commissions—I am familiar with a number of them who use on a very regular basis Landsat data for national planning purposes—the prices that they are paying for the data are within reach of their budget and do not, I suppose, have too much influence on the direction of future research.

I think the user needs should drive the system. When I was the deputy head of the U.N. environment program over a year ago at the U.N. space conference in Vienna, I made precisely that point and, indeed, at that time, I said that the—I felt that the system being developed by the United States and other leading technological states was putting itself almost beyond reach of those nations who need it the most and I felt that we should not let the best be the enemy of the good. Most of the world needs the kind of interpretation capability which is available with minicomputers, but it—most of the world will not for a long time be able to engage in the much more expensive analytical work which a number of the larger corporations, interested particularly in minerals and energy, not only can afford to do, but do so because it makes sense to do so.

Mr. LUJAN. Well, I think you put your finger on one of my concerns: these kinds of organizations that you're talking about, not the commercial, for-profit ventures. I have a general feeling that to those organizations, you must give a lot of the technology, if I may, and I don't mean it derogatorily, but they're used to receiving and not paying for it, and so what we would have to depend on to drive the—the system would be those energy companies, someone that wants to, you know, fish for profit, farm for profit, those sorts of things, and I am just concerned that whether or not there's sufficient need by those companies that they would be willing to pay and pay substantially for it.

Do you think that the market exists for that?

Mr. THACHER. I don't believe that the market exists outside of North America, Western Europe, probably Australia and Japan.

Mr. LUJAN. Yeah.

Mr. THACHER. But I believe it is in the other parts of the world, principally in the tropical regions, where the need is the greatest. For example, to anticipate crop failures—there isn't any profit in it——

Mr. LUJAN. Well, I understand what you're saying about the need and that's not really the direction that I'm moving in. I think we all recognize the need. The direction that I'm trying to go in, are there enough people that are willing to pay for it in order to keep the—the commercialization going? That's, I guess, the bottom line of what I'm saying.

Mr. THACHER. I—I think that—it's difficult for me to imagine the purchasing power of agriculture, which is not dependent on high energy inputs being sufficient to keep—to create a market.

Mr. LUJAN. Yeah.

Mr. THACHER. I believe it is only that form of agriculture that we take for granted with enormous energy input which accumulates sufficient purchasing power to drive such a system, but I believe that what is happening on a planetary scale is the converse of that; energy per agricultural output is diminishing in most parts of the world, with the obvious results of putting stress on marginal soils beyond which the vegetation can recover, and I believe it is the absence of an awareness and a diagnosis of that problem which allows the per capita food production of the whole continent of Africa to continue to drop for what is now more than 10 years.

Mr. LUJAN. Yeah. Thank you, Mr. Chairman.

Mr. VOLKMER. Thank you. The gentleman from Virginia.

Mr. BATEMAN. I have no questions, Mr. Chairman.

Mr. VOLKMER. I have one little statement I want to try and summarize. It appears to me your main emphasis on the—your statement is your concern for the ability of continued use of some of the underdeveloped nations on the data if the Landsat is commercialized. Is that a fair statement?

Mr. THACHER. Yes, sir; with a slight additional qualification and that is that the data itself may remain available, but financially beyond the reach of the users, but also the nature of the data may be tuned in order to maximize the commercial return.

Mr. VOLKMER. In other words, if it's specific data pertaining to geological structures or something like that, that wouldn't necessarily benefit the areas that you're concerned about.

Mr. THACHER. Yes, sir.

Mr. VOLKMER. And as you—our legislation that we have introduced doesn't really address that concern. Do you think that we should in there provide for some way to try to address that concern regard to the—what I say the deforestation or agriculture or soil erosion problems?

Mr. THACHER. I would welcome a statement reflecting the policy of the Congress in that sense, sir.

Mr. VOLKMER. And I think the gentleman from California is trying to address it. There is no question in my mind about that with the idea of some type of a global effort in this regard. You generally agree—if that could be feasible, it'd be a way to go.

Mr. THACHER. I do and I have no doubt on the basis of my own discussions with agencies and with governments literally all over

the world, that it would receive very, very strong, widespread support.

Mr. VOLKMER. Mr. Thacher, I have no further questions. Anyone?

I want to thank you for being here today and you've been a great help to us.

Mr. THACHER. Thank you, sir.

Mr. VOLKMER. Our next two witnesses are Dr. Frederick Henderson, The Geosat Committee, and on the same panel, Mr. Donn Walklet, Terra-Mar, Inc.

All right, Dr. Henderson, your statement will be made a part of the record in full. You may either summarize the statement or if you wish, you may review it in total, however you so desire, and you may proceed.

STATEMENTS OF FREDERICK B. HENDERSON III, THE GEOSAT COMMITTEE; AND DONN WALKLET, TERRA-MAR, INC.*

Mr. HENDERSON. Thank you, Mr. Chairman. I would like to submit two additional documents to the record if I may—is this on?

Mr. VOLKMER. Yes, we can hear fine.

Mr. HENDERSON. I would like to submit two additional documents for the record if I may and also, if appropriate, at a later time, provide my detailed comments on the legislation itself.

Mr. VOLKMER. All right. We will hold the record—when will you have the detailed comments on the legislation available?

Mr. HENDERSON. Hopefully by Friday.

Mr. VOLKMER. All right, we'll hold the record open until those are available. Include those in the record.

[The information referred to follows:]

*See appendix, p. 1326 for corrections to oral testimony submitted by Mr. Henderson.

Sy 312 041-3

Mr. Richard C. Atkinson
Chairman
Satellite Data Archiving Project Panel
National Commission on Libraries and Information Sciences

Presentation by:
Dr. Frederick B. Henderson III
President
The Geosat Committee

Mr. Chairman:

It is indeed a privilege to represent the Landsat user community in presenting to you our concerns regarding the so-called 'value' of Landsat data and the issues associated with the archiving and distribution of these data to the ultimate end user. I will first discuss some basic issues about the 'value' of the data, continuity of Landsat land observations systems, and the long term archiving policies which need to be instituted to protect this valuable national asset.

BACKGROUND

Although I believe my comments will reflect the general opinions of the Landsat user community, I do not pretend to represent all of the Landsat data users. Landsat was designed primarily for agriculture, land use planning, hydrology, timber monitoring, etc. It's principal supporter in the U.S. government, outside of NASA, was the Department of Agriculture, who wanted to use the data for monitoring worldwide renewable resources, notably the wheat crop. Geology was not a prime factor in the design of Landsat's MultiSpectral Scanner (MSS). However, since 1972 the industrial geological community has become the principal user of Landsat data outside the government. The Geosat Committee, of which I have been President since 1976, has served as an important focus for the private sector industrial geologists, the U.S. government, and other governments such as France, Japan, Canada and others, in attempting to coordinate our interests in satellite remote sensing for worldwide non-renewable resource applications. My presentation here today will focus largely on our experience in dealing with these issues. We have much in common with the other disciplines in our interests in both land and offshore exploration programs, where much of the world's future oil and gas will be discovered. I hope that my comments today will be of use to you as you review this difficult and important problem of the Landsat data and archiving. I believe that my comments in general will reflect the thoughts of geological and non-geological users of data derived fr[illegible] the Landsat and other land observation satellite systems.

VALUE OF LANDSAT DATA

First of all, I should like to express the feelings of most of my collegues by stating that there is no monetary 'value' assigned to Landsat data. The only 'value' that can be attached to the Landsat system is the multi-tiered levels of information that can be extracted from the data itself. In our community the value of the information extracted is indirect and it is virtually impossible to place a dollar value on the acquisition of Landsat data, or to determine how many barrels of oil or tons of copper will be found because of the use of Landsat data. There is no way to accurately establish a cost-benefit analysis. It is extremely important to understand that Landsat is used as one of many tools in the exploration programs. It is one input among many which lead directly to the ultimate exploration decision to drill a target or make an engineering decision. Big dollars are spent on seismic, gravity, and magnetics in the ultimate decision of to drill or not to drill. To many upper managements, the cost of the Landsat data is in the 'noise' level of the total cost of the exploraiton program; yet those of us who have learned of the significant information content in the MSS, and more importantly, in the Thematic Mapper (TM) and the syanthetic aperture radars (SAR), are becoming increasingly supportive. The importance of this information in guiding more expensive later stages of exploration toward ultimate success can be and is being demonstrated on an increasing scale. As the user community learns to integrate the information extracted from Landsat data into the total decision making information system, its importance and the growing commercial market attached thereto will grow rapidly.

It is safe to say that today probably less than 200 exploration geologists understand the true information potential contained in Landsat's Thematic Mapper system. This is because less than 200 geologists have had an opportunity to obtain TM data, utilize it through empirical algorithms to provide preliminary imagery, take that imagery into the field and use ground radiance measurements to define the specific rock, soil, and vegetation units of interest, then refine the computer algorithm to produce the final field maps which allow them to rapidly map targeted regions over the very large area of a Landsat scene. This mapping process takes man-years to do by normal field methods. It is the significant savings of time brought about by sophisticated information extraction from the raw Landsat/TM data that underlies the tremendous potential importance of this technology.

In my experience, most Landsat users emphasize the savings attributed to the use of Landsat and the increase in efficiency of their exploration and engineering programs because of this use. As an example, the Geosat Committee is currently compiling a number of industrial case histories of Landsat use, one of which has been provided by the Bechtel Corporation, who recently acquired an in-house Landsat imagery digital data processing capability. Their assignment was to find a deep water port location along a 70km stretch of the Venezuelan coast. This coast is poorly mapped and the lowest bid for a standard bathymetric survey was $150,000. With their new in-house digital data processing system, however, Bechtel used the shorter wave bands of the Landsat/MSS to 'see' into the water to depths of approximately 80' and determine where deep water came close to shore. This cost Bechtel $1000 in processing time; a spot bathymetric check of the Landsat information cost another $10,000. The use of Landsat imagery saved Bechtel's client roughly $140,000. The importance was the ability to complete this assignment far more rapidly and inexpensively than it could be done using standard techniques. This sort of example holds true throughout the exploration, engineering, and environmental geological community. Similar kinds of savings proving the importance of the Landsat data can be demonstrated by users in other disciplines as well.

Therefore, the real 'value' of Landsat is inherently tied to the importance of the information extracted from these data and their input into the total decision making information gathering systems utilized both by industry and government.

I wish to make one further statement regarding the importance of Landsat data to the U.S. and to the rest of the world. The geological distribution of energy and mineral resources is global and bears little relationship to current national borders. Unlike all other industrialized countries, the U.S. has no civil government agency chartered to acquire resource information nor does it concern itself at the Cabinet level with the future location of this country's energy and mineral requirements over the long term. The Nixon, Ford, Carter, and Reagan Administrations have all attempted to focus upon diminishing our dependence on outside non-renewable resources. Some aspects of these policies are undoubtedly useful, but it is folly to believe that we can ever be resource independent. As a world leader we are inherently involved in the global discovery and trade of non-renewable resources. The

responsibility to explore for and provide these non-renewable resources to the U.S. economy resides in the private sector. Our principal international competitors for these resources work through cooperative government/private sector policies to assure their future resource needs are met. We do not. The Geosat Committee is one of the rare and unique examples of an effort to fill this void in cooperation in the U.S. It is also our role to fill that communication void between us and international companies and governments worldwide. In many parts of the world the Landsat data base is the only geological mapping data base, and it is my personal belief that this is of serious national security interest to the U.S. If we were to lose access to this sort of technology we would be at a significant disadvantage in competition for non-renewable resources around the world. If we lose this technological capability in the U.S., we also risk seeing the demise of the "Open Skies" policy and its affect on other countries' satellite systems and availability of their data to us all in the future. This has been eloquently discussed in Robert Porter's testimony before the House (attached). It is his view that the next generation of remote sensing satellites will become more and more proprietary and/or nationalistic without the advantage of reasonable access to all under the "Open Skies" policy.

CONTINUITY

The Geosat Committee supports the need for a strong U.S. government commitment to the continuity of earth observation satellite systems such as the Landsat/TM, SAR, and future satellites of this type. We support the commercialization process when it can be demonstrated to provide the needed requirements. We believe the government must continue the present Landsat program until it can be effectively taken over by one or more commercial entities who will provide Thematic Mapper and other required data, even if this commercialization process takes 10 years or more. As previously stated, a knowledgable market for the TM-type data does not yet exist and will take time to evolve. During this transition time the U.S. must not allow this technology to collapse.

Secretary Malcolm Baldridge has testified that if there is no acceptable bid made through the RFP process to be concluded in May 1984, the Department of Commerce would support a continued land observation program as in the best interests of the U.S. While this is reassuring, we hope that this committment to continuity will also come from the full Cabinet and the White House.

One important reason for the U.S. government to commit to data continuity is to maintain growth of Landsat-type digital data processing within industry, academia, and government by allowing continued access to satellite data. The current program, which presumably will be picked up again by LANDSAT-5 using the TDRSS, with its maximum of 10 TM scenes per day in CCT format is simply incapable of acquiring a good minimal Thematic Mapper global data set, as required by the geological community. The Geosat Committee believes that LANDSAT-5 must have an operable X-band downlink and the government should also commit to a continuation of this program so that governments around the world with ground receiving stations or those interested in building such will in turn commit their limited resources to upgrading these stations in order to assure the acquisition and archiving of Landsat/Thematic Mapper data, as well as other data during the next decade. These countries are reluctant to make their own committment in the absence of a firm, long term U.S. policy to provide land observation remote sensing data, either by the government or the private sector or both. The Geosat Committee statement on continuity of both systems, and on long term, exploratory high risk R&D is contained in the attached letter addressed to Senator Packwood and Congressman Scheuer.

National Archive

The Geosat Committee believes that a central national archiving facility for Landsat-type and other remote sensing data in the B-tape or equivilent 'raw' data format should be established. These data should be available to all on a rapid delivery, reasonable price basis. We believe that only through access to such raw data will a strong, multi-tiered value-added industry develop which will help create and serve the multitiered user market which must be developed in order to commercialize any satellite system. This applies to the government user as well as the private sector user, as discussed in the attached paper, "The Significance of a Strong Value-Added Industry to the Successful Commercialization of Landsat". The Geosat Data Management Subcommittee has established our requirements and concerns about data distribution and archiving. These are herewith submitted in our Data Management reports of Nov. 1978, Nov. 1979, and Nov. 1982. I would request that this Panel give serious consideration to reviewing the recommendations found on pages 4 and 5 of the 1982 Report and give them your endorsement. In particular, I recommend that your panel endorse the concept of establishing such a national archive, and that a Program Board of both government and private sector users be created to guide the archive as to what data should be retained.

QUESTIONS

I would like to briefly address the questions submitted to me by Toni Bearman, Executive Director of the National Commission on Libraries and Information Science. In the short time available to review these questions, I received guidance from a number of Geosat members. I wish to dra · your attention to the letter from Dr. Ralph Baker, AMOCO International. He has reviewed these questions and his letter is an extremely well-stated document on the importance of Landsat imagery to AMOCO. I would rank AMOCO as a maturing Landsat data user in that they have a well-established program and have just made the decision to spend $2M to buy an in-house digital data processing system and thus become a full-fledged worldwide Landsat data user.

1. What is the importance to users and what kind of archived data are found most valuable and to whom?

I think the background discussion establishes the importance of the data for the users whom I represent. In many instances Landsat is the only data set that can be used for geological analysis. The use of such data saves time and money for ground based exploration. As an example, of the Geosat companies who bid for the People's Republic of China off-shore exploration, ALL used Landsat data to obtain the most effective onshore geological maps with which to project the information off-shore as China did not provide them with geological maps. Had there been no Landsat data they would have been at a considerable loss to understand the fundamental geology around the basins for which they were competing. At present, the most valuable archived data set is that of the Landsat/MSS, supplemented by limited SEASAT and SAR data; not enough TM data were able to be taken. To many users, the standard film products are of great importance, but the archiving of the B-tape format data is clearly of the utmost importance. The film archive is of importance to a wide variety of users, but the B-tape data is critical to the sophisticated user to extract the maximum amount of information from these data.

2. Are there alternative sources for the same or similar data?

An alternative source for satellite MSS data will be commencing in early 1984; this will be the French SPOT satellite data which will provide us with excellent information in the MSS' .5 to 1.1 micron region, with high resolution (10-20 m), and a stereo component. These data will supply two of the four basic requirements established in 1976 by The Geosat Committee. Similarly, bands in this regi will presumably be provided by the Japanese in

the early 1990's. However, there is no substitute in satellite format for the TM which provides the geologist and other users with the invaluable data from the shortwave infrared (SWIR) for the detection of clays, carbonates, alteration, etc., until the Japanese JERS-1 flies in 1990-91. This assumes the Japanese will make that data available under the "Open SKies" policy, which may or may not prove to be the case. Under the present proposals for commercial systems there is no firm proposal to provide SWIR at 1.6 and 2.2 microns, 30 m resolution instantaneous field of view (IFOV) as yet, because a commercial focal plane technology does not exist.

However, for all of these satellite systems there is the alternative of airborne remote sensing, in the visible (VIS), the ~~very~~ near infrared (VNIR), SWIR, thermal infrared (TIR), and radar. For site specific applications, these airborne systems are more than adequate, but for fundamental exploration on a regional basis, especially outside the U.S., airborne systems are definitely inferior to integrated digital data from Landsat, SPOT, SAR, and other satellite systems.

3. If these data were not available, what would be the impact to the various user community?

Speaking primarily for the geological community, if these data are not available nor are the non-U.S. alternative sources, money will be spent on other techniques for general exploration. If a worldwide seasonal and MSS data set of TM data is not available to the energy and mineral exploration community, the result will be continued increasing costs in terms of time and money for resource exploration. These costs will be ultimately passed on to the consumer, and will eventually result in fewer discoveries. If these data are not available to U.S. companies, but are to non-U.S. companies who have subsidized national programs, we will find our competition in the non-renewable resource world market significantly more expensive and difficult.

4. Would users be willing to pay for data, and could they afford to pay if they had to buy it at the full unsubsidized cost from a private owner?

I would first refer the Panel to Dr. Ralph Baker's letter, which states a typical answer to this question: the more sophisticated users in the geological community already have a reasonably full data bank of Landsat MSS

data. They require at the minimum one global data set of TM data. If TM data is priced much higher than it is today in order to cover the unsubsidized cost of the satellite and ground systems of a private owner, most users would significantly reduce the volumes of data required. They would utilize existing MSS data bases to purchase TM data selectively and site specifically. It is likely under the present scenario that only the largest of energy/-mineral companies would be able to afford the data. Individual consultants, smaller firms, state and local users, and private individuals would be denied access to such data. Researchers in academia would also suffer this loss.

As mentioned in Dr. Baker's letter, a number of Geosat member companies have initiated an informal one-for-one tape swap arrangement. This is in direct response to the growing recognition that individual libraries of tapes cannot be supported as the data accumulates. The common practice of exchanging raw data between companies is also in response to the increases and proposed increases in tape prices, and companies are in the process of formalizing tape swapping. The Geosat Committee is considering the next step of encouraging the development of a formal geological remote sensing tape library. A comparable swapping arrangement has developed among a number of universities, particularly the University of Kansas. It is notable that such tape swapping arrangements, which undoubtedly will grow internationally, fly in the face of anyone's proposal to copyright raw data.

Attachments

Decision-Making Capacity Charts
Description of The Geosat Committee
Geosat Committee Position on Commercialization Paper
Letter from Dr. Ralph Baker, AMOCO INTERNATIONAL
Robert Porter Testimony before House
Transcription of the Remote Sensing Issues Panel, 4th Geosat Workshop
"The Significance of a Strong Value-Added Industry to the Commercialization Proc

Paper presented at the AAAS Symposium Feb. 24, 1983, Goddard Space Flight Center

THE SIGNIFICANCE OF A STRONG VALUE-ADDED INDUSTRY TO THE SUCCESSFUL COMMERCIALIZATION OF LANDSAT

Frederick B. Henderson III, Ph.D.

The successful 'commercialization' of a continuous U.S. Landsat-type earth observation remote sensing system will depend largely on the development of a strongly competitive free market value-added industry. Such an industry should include basic digital data processing companies, government agencies, resource companies, service corporations, as well as those who use film products and other less sophisticated satellite data. The value-added industry provides the extraction of useful information at various levels from basic Landsat raw data. This is true whether or not the space segment belongs to the government, the private sector, or is jointly owned and/or operated.

It is vital to the U.S. as well as to global interests that the continuity of a U.S. Landsat-type satellite system and a strong civil remote sensing R&D program be maintained. In order to commercialize such systems, a strongly competitive value-added industry is imperative.

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Frederick B. Henderson III, Ph.D.
March 17, 1983

INTRODUCTION

In the spirit of the Carter Administration's Presidential Directive 54 (PD 54), the current Administration and Congress is evaluating mechanisms for commercializing the Landsat earth remote sensing satellite systems, as well as the wisdom of so doing. Among the many complex issues related to Landsat commercialization is that of the development of an important new technology and the necessary lag-time for its commercial acceptance by the user community. Had the user community the desire, ability, and risk tenacity to design their own satellite system for their uses, a ready market would already exist for such a system. However, Landsat was developed as an R&D technology by NASA, with the development of a user market and a corresponding commercial structure coming after Landsat was demonstrated to be operational. At present, the government, believing the Landsat system to be "operational", is studying mechanisms for transferring it to the private sector as a commercial venture. This paper discusses the importance of a strong value-added industry as a key element in the successful transfer of Landsat-type satellites from the government to the private sector. However, it is important to realize that the value-added industry is vital to the optimal use of Landsat data whether or not Landsat, as a system, stays within the government or is transferred to the private sector.

DEFINITIONS

Landsat

The actual Landsat system is well known (see Figure 1). For 10 years, data designed to discriminate vegetation has been received from the Multi-Spectral Scanner (MSS) of Landsats 1, 2, and 3. LANDSAT 4 and the future LANDSAT 5, with the new, expanded Thematic Mapper (TM) sensors operating reasonably well in the technological sense is hampered by the failure of the LANDSAT 5 X-band transmitter downlink; further data acquisition will be through the TDRSS (Tracking Data Relay Satellite System). The TDRSS will provide data through NASA's White Sands receiving station and the Goddard Space Flight Center (GSFC) ground processing station capability with NOAA as the operator; but is limited at best for global data acquisition and processing under present funding. However, in considering commercializing the Landsat program, Landsat follow-on satellites and satellites perhaps not yet defined are being referred to. We are speaking of the commercialization of land observational satellite systems which, within the U.S., could include future solid state multi-line array systems with various spectral and spatial resolutions, free-flying radar satellites yet to be proposed, and other earth observational satellite systems which would benefit the general civilian and government user communities.

Commercialization

For the purposes of this paper, 'commercialization' can have a wide variety of meanings. Ultimately, the intent is that the land observational satellite systems under discussion would become commercially successful private sector endeavors. To be commercially successful, an acceptable profit would have to be made by a commercial organization which would operate and control the satellite systems, part of the ground and value-added segments of the total system of land observational satellites in data acquisition, archiving, processing and distribution. A prime question in dealing with the commercialization of the Landsat-type systems is whether the satellites themselves are commercial or is such commercialization dependent upon the successful commercialization of the end product; that is, the data which is distributed to users within both the government and the private sector. It appears that no satellite currently envisioned would be commercially successful without a successful, profit-making commercial ground segment. The information derived from the digital

COMPARISON OF LANDSAT MULTISPECTRAL SCANNERS

	MULTISPECTRAL SCANNER (MSS)	THEMATIC MAPPER (TM)
SPATIAL RESOLUTION	80M	30M/120M
SPECTRAL RESOLUTION NUMBER OF BANDS	4	7
BAND PASSES	2 VISIBLE 2 SOLAR INFRARED	3 VISIBLE 3 SOLAR INFRARED 1 THERMAL INFRARED
QUANTIZATION	64 LEVELS	256 LEVELS

UTILITY OF SPECTRAL REGIONS

MSS	THEMATIC MAPPER	
	0.45 - 0.52 UM	SENSITIVE TO CHLOROPHYLL AND CAROTINOID CONCENTRATIONS GOOD WATER PENETRATION (SEDIMENT LOAD AND BATHYMETRY)
0.5 - 0.6	0.52 - 0.60 UM	VEGETATION GREEN PEAK (REDUCED CHLOROPHYLL ABSORPTION) DISCRIMINATION OF IRON CONTENT IN ROCKS AND SOILS
0.6 - 0.7	0.63 - 0.69 UM	SENSITIVE TO CHLOROPHYLL
0.7 - 0.8 0.8 - 1.1 0.8 - 1.1	0.76 - 0.90 UM	SENSITIVE TO VEGETATION DENSITY OR BIOMASS
	1.55 - 1.75 UM	SENSITIVE TO LEAF WATER CONTENT SEPARATES CLOUDS FROM SNOW
	2.08 - 2.35 UM	SENSITIVE TO ALTERED (MINERALIZED) ROCK
	10.4 - 12.5 UM	THERMAL PROPERTIES - ROCK DISCRIMINATION PLANT STRESS, SOIL MOISTURE

Figure 1. A Comparison of Landsat Multispectral Scanners and Utility of Spectral Regions

From "Advanced Aerospace Remote Sensing Systems for Global Resource Applications," by James V. Taranik, presented at the Fifteenth International Symposium on Remote Sensing of Environment, Ann Arbor, MI, May, 1981.

data and/or film products from Landsat and other systems is the saleable commodity. Therefore, the existence of a value-added industry to convert these satellite data into valuable information for which the user community is willing to pay is the critical issue.

Value-Added Industry

When defining the value-added industry, one must include a number of sources involved in converting Landsat-type data into useful information. Landsat 4 observes sun radiance values reflected from the earth's surface at about 9:30 AM on the same location every 16 days. The radiance levels in these 7 Thematic Mapper bands were transferred down by the currently non-functional X-band transmitter downlink. Hopefully, these will be transferred through a K-band communication link with the TDRSS satellite, when it is operational in late 1983, down to the United States ground receiving stations, then through DOMSAT to NASA/Goddard (GSFC). These digital data are currently planned to be acquired at 100 scenes per day (SPD), and then converted to 50 SPD film products, of which 10 SPD will then be provided to the user community in Computer Compatible Tape format (CCT's) when operational and transferred to NOAA in 1985. This is simply inadequate to cover the world's land surface for the geological community over the reasonable lifetime of the LANDSAT 4/5. The limitations are in the ground segment, not in the satellite itself.

The products, film and CCT's, are distributed for public purchase through the EROS Data Center in Sioux Falls, South Dakota. The film products are a final commodity as a standard product to users, those who do not choose or do not need sophisticated data processing and value-added information derivation from the original data. This is not the market which will commercially support a total Landsat type system because at this level the information derived tends to be simplistic. The value which would lead to commercial success lies in the ability to process and manipulate these data in useful information programs, and integration with other data techniques is where the primary future value lies for the geological community. It is reasonable to say that this is probably true for other major disciplines, such as agriculture, timber, land use, hydrology, etc.

Therefore, the value-added industries are the service companies who, for a fee, will take the data from the operator(s) of the satellite, ground acquisition, archiving, and processing systems (government or private sector), and create sophisticated, useful information from the data itself beyond the standard film product currently planned and provided by the EROS Data Center. It is this discipline-oriented information, processed and utilizing derived ground truthing techniques as an iterative process with the data itself, that becomes valuable to the user community. Because of the tremendous variety of data processing techniques to derive information of value to the exploration geologist and interpreter of such data, a multiplicity of information levels exists, any one of which may be combined with other exploration data. Data integration can lead to a successful exploration program, such as the discovery of a mine or an oil and gas field, or, in the case of other geological users, in the successful solution of geological engineering problems such as plant sitings, fault studies, and other engineering or environmental applications.

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Thus, in discussing the value-added industry, one must include the various types of value-added systems. Beyond the current data product provided by the government or proposed by similar systems under current study, these would include a variety of different users who process data, conduct ground truth, and analyze and interpret remote sensing data. These might include universities doing various applications of land observational data studies; government agencies who possess in-house digital data processing capabilities in order to convert the data to useful information for their purposes; user companies, such as the oil/gas and mineral companies; engineering companies who also possess in-house digital data processing capabilities to take the raw data and convert it to useful information for their individual purposes; and the actual service industry, who, in general, represents the "value-added" industries under discussion. It is important to keep in mind that all of these are, in fact, parts of the value-added "industry," even though only the service industry provides this kind of data for a fee. Successful commercialization of a Landsat-type program will require an integration and interface with all of these segments of the value-added industry.

Continuity

Continuity of the Landsat-type earth observation satellite systems refers to continuity of these technically ever-evolving types of data-gathering systems. It does not imply endless commitment to the Landsat Multi-Spectral Scanner (MSS) or Thematic Mapper (TM) sensor systems. It does, however, refer to a continuous U.S. land earth observation satellite system series which might include LANDSAT 5/TM, LANDSAT 6, 7, 8, etc. These systems may include significantly different and technologically improved sensors, satellites, and ground processing systems with different data and value-added information products. Such new sensor/satellite technologies will depend largely on a strong civil remote sensing, high-risk R&D program such as has been historically developed by NASA.

THE VALUE-ADDED INDUSTRY AND COMMERCIALIZATION

Having defined the various components of the subject of this paper, it is now appropriate to look at scenarios related to the value-added industry and the successful commercialization of Landsat-type satellite systems.

The Landsat satellite in itself is designed for many users and, as a system, may not serve the individual needs of the user community. That is to say, the band selection for the Thematic Mapper, while containing information of great interest on all bands to the geological community, might not be the precise band assemblage were such a system designed for the geological community alone. For example, many sophisticated users of Landsat data have ample supplies of MultiSpectral Scanner (MSS) data in the 0.5 - 1.1 micron region in their archives or accessible to them through other services. In many instances they are interested in purchasing the Thematic Mapper data because of the higher 30m spatial resolution as well as the valuable new shortwave infrared bands (1.6 - 2.2 micron band regions) and the Thermal IR band.

When these data are in the hands of a field geologist who understands their importance, how to interpret and use their information content, the new and unique information from these bands will prove quite valuable to the commercialization process of the Landsat system and the Thematic Mapper. Some of the information from the Thematic Mapper will not be used because it is not new or of significantly increased information value for the user. It is difficult,

indeed, premature, to assess which bands, how much of each band, and how much processing of each system is necessary to the total community. Therefore, at this time it is difficult to assess the true economic value of each band, let alone the total Landsat-type system. In 1983, it is probably reasonable to state that only a few hundred geologists have any real understanding of the value of the geological information contained in the Thematic Mapper. With access to the data, this situation will rapidly change.

A transition period is required while transferring Thematic Mapper-type data from the government to the private sector for a purely commercial venture. The NASA R&D Landsat program was never funded by the government to act as an operational, international-user, data-producing system. As such, the commercially acquired global marketing and servicing infrastructure is not developed in the present Landsat system which the government wishes to commercialize. The commercial market development and transition time must be supported through appropriate mechanisms acceptable by the government or commercial entities to allow time for the user community to understand the value of the data they are being asked to support commercially. If the government simply stops the system in the interest of saving money and turning it over to the private sector, it is making a fundamental mistake because at present the private sector cannot possibly commercialize this Landsat program instantaneously. However, many people believe strongly that the Landsat system, or portions thereof, such as the value-added ground segment, contains significant information of present value to the private sector, to the government, and to our nation. They further believe that civil satellite remote sensing systems will become commercial when the necessary learning and transfer time has passed.

It is during this transfer time that all forms of the value-added industry are of critical importance to the commercialization process. Without a strong, viable value-added industry free to grow in a competitive market that is serving many different types of users with many different types of products, the commercialization process is doomed to failure.

CONCLUSIONS

The LANDSAT 4/Thematic Mapper system contains the potential for extremely valuable global information for exploration and engineering geology around the world. It is a national and international asset. The data and new geological value-added information derived from it can significantly impact exploration hopes for basic energy and mineral resources and global access to them over the next 30 or more years. Because the United States and other industrialized countries depend on, and will continue to depend on, successful exploration for basic energy and mineral resources in exchange for delivered technology to non-industrialized, resource-rich countries, the continuity of the U.S. Landsat-type earth observation satellite system under the "Open Skies" policy for civil remote sensing is of paramount importance to the U.S. and to the world. Should the U.S. government and industry allow, through the "commercialization" process, this vital technology to slip through our fingers we would be faced with future dependency on non-U.S. sources for Landsat-type data, or none at all.

The present U.S. government decision to terminate the R&D LANDSAT 4 and 5/Thematic Mapper system without adequate guaranteed means for transferring the system with sufficient time for a commercial market to develop may lead to an unacceptable

U.S. situation. If the commercial transferring mechanism is to go to one or more private sector organizations, then during the transition period these organizations must make the "raw" data available to competitive value-added services or provide all of the required user services themselves. Without the competitive nature of a strong value-added industry it is unlikely that the products, the services, and the multilevel-derived geological information will be made available to the private sector energy/mineral explorationist with whom lies the U.S. charter for finding our future non-renewable resources. If so, a commercial market is likely to evolve.

In the best interests of the United States and of global energy/mineral resource geological understanding, it is imperative that the United States maintains a continuity of the Landsat-type earth observation satellite systems, either within the government, within the private sector, or jointly. In order to maintain leadership or at least international parity with other international satellite remote sensing technologies, the United States must commit itself to a strong, continued high-risk, exploratory remote sensing R&D effort within NASA. Reliance on remote sensing R&D within the military establishment or within the private sector is not in the national interest, as both are interested primarily in low-risk, high-reliability remote sensing technologies for well established goals under security or proprietary constraints. Only a strong national commitment to a continued civil remote sensing observation satellite system either within the government, the private sector or some combination of both will assure U.S. access to such data and the necessary national value-added global geological resource information to be derived from them during the next several decades.

Mr. HENDERSON. I am appreciative of the opportunity to testify before the subcommittees on behalf of The Geosat Committee, which I represent, on the issues related to the commercialization of land remote-sensing satellite systems and the potential impact on this country's growing dependence on global sources for strategic energy and minerals.

Because the U.S. economy will always depend on access to such global resources, it is in the national interest to assure that the civil land remote-sensing systems are maintained, protected, and caused to continually evolve through a commitment by the U.S. Government.

The Geosat Committee is sponsored by a number of U.S. and non-U.S. international oil, gas, and mineral companies who utilize geology and who, since 1976, have worked with the Government and testified here several times in an effort to improve the Landsat program for geological applications.

We just completed—one of the reasons I haven't had a chance to finish everything I wanted to before this hearing was we completed our seventh annual meeting in Houston last week on Friday and discussed a number of the applications—a number of the developments regarding commercialization, both in Congress and the administration.

The Geosat Committee strongly supports the recent positions taken by the Civil Operational Remote-Sensing Satellite Advisory Committee [CORSSAC], chaired by Michele Halbouty, and in addition, we reviewed your letter of October 25 to Secretary Baldrige and share the concerns that you have expressed therein.

The commercialization of the civil land remote-sensing systems, we support in the long term, but as the largest group of users, sophisticated industrial end-users of Landsat data, we really don't care who owns, operates, or develops the systems; what we do care deeply is that a strong civil land remote-sensing program be maintained in the United States and that it will continually provide us

with the kind of data we need to compete internationally to explore for energy and mineral resources upon which the United States, her allies and trading partners require over the next several decades.

The current debate over commercialization has tended to polarize the interests of government versus those interests of the private sector. The Geosat Committee believes that the commercialization process should be a means to an end, namely to provide cooperation between government and the private sector to create a strong and continuing evolving civil land remote-sensing program in the United States.

Regarding the question of commercialization of the meteorological satellites, we have no position. Our prime interest, as you know, is in the Landsat program. We are concerned, however, with the present mood in Congress that to deny the commercialization of Metsats, we hope that the Landsat program will not suffer because of this—decisions regarding the meteorological satellites.

A prime area of interest is continuity of data. The Geosat Committee believes that the continuity of a strong and continuously evolving civil land remote-sensing program is of vital importance to the United States of America. We believe this is true whether the program resides in the Government, in the private sector, or both.

We do not agree with the base—with the inference in your legislation that the baseline should be the multispectral scanner type technology. We would prefer to see continuity continue to evolve as technology evolves.

The MSS, for our purposes, is antiquated and redundant with respect to the Thematic Mapper. The basic MSS data can be produced on board the spacecraft from the TM system, for those who care to pay for it. We, therefore, believe the U.S. baseline should be the thematic mapper.

Our basic goal for the 1980's for our purposes is to acquire at least a one-time global data set of Thematic Mapper data. We applaud the recent administration and congressional actions in speeding up the process of Landsat D′ to replace the unfortunately failing—or ailing Landsat 4.

Our committee strongly supports the Halbouty CORSSAC recommendation to push forward for early lead items for Landsat D′ and an early Government commitment to fly Landsat 6. This appears to be the only way to avoid the Thematic Mapper 3-year data gap built into the current request for proposal [RFP]. This 3-year data cap—or gap, were it to exist, in our opinion would be disasterous to the development of a civil land remote-sensing program in the United States, increase our dependency on overseas data sources, and also reduce or stifle the growth of ground receiving stations around the world, which is important to acquire that global data set of TM data with the minimum number of satellites.

Because the OMB appears to be adamantly opposed to continuing the Landsat TM program beyond Landsat 5, Geosat Committee urges Congress and your committees to take the leadership in protecting the U.S. program and providing continuity of data until such time as a realistically commercial system can provide the data we require.

In order to maintain a strong, continuously evolving civil land remote-sensing program, the U.S. Government must revitalize and commit to a continued high-risk exploratory sensor and applications research and development.

Without such continued R&D, it will not be possible even to design future civil land remote-sensing systems capable of maintaining the U.S. leadership or even parity with the burgeoning remote-sensing technologies developing outside of the United States.

Military R&D in this area will not trickle down fast enough for civil applications internationally and private-sector R&D is simply not commercial and is not leading toward new systems.

The Geosat Committee supports the position expressed in your draft legislation and your letter to Secretary Baldrige regarding the open skies policy. International cooperation on the development of complementary and compatible civil land remote-sensing satellite systems and ground stations is paramount to the sensible development of global civil systems.

If for whatever reason, the principal satellite-producing country should turn away from the open skies policy, then the world risks an expensive proliferating intelligence arms race to develop nationalistic remote-sensing satellite systems to further compete for world resources. I would like to underline that point.

The Geosat Committee believes that there is no inherent incompatability between the open skies policy and the requirements of a commercial proposal for proprietary rights and copyright—under international copyright laws. We believe that through the various legal standards of group shoot type data purchase and nonexclusive data sharing familiar to our industry, that the concepts of the open skies policy and the responsible commercial control of data and information derived therefrom can be mutually satisfied.

We concur with your concern about protecting the development of the value-added industry and its role in creating a real market necessary to commercialize the civil land remote-sensing in the United States. We believe that the value-added industry can expand and can become commercial now. This is particularly true if the Government is removed from the data-handling process.

The Geosat Committee supports the Halbouty CORSSAC position that the land—value-added industry is better protected by making nondiscriminatory access to Government and/or private-sector data stream—that is, a satellite—in the raw data format. We agree with your proposed legislation on this point of access of—to unprocessed or minimally processed data.

We also strongly believe that this type of data, and perhaps selected computer-compatible tapes derived therefrom should be archived in a Government-supported national archive. Commercialization of the ground segment value-added industry has begun and clearly is the first viable segment that could be transferred to the private sector as part of a phased transition commercialization of civil land remote-sensing.

In this context, we agree with your letter of October 25 expressing concern regarding the restrictiveness of the RFP process requiring bids only on the total system, that is the space and ground segments. We believe that a market-driven strong value-added in-

dustry capable of providing multilevel products to a multilevel use community is a paramount requirement to the eventual success of commercializing the civil land remote-sensing program.

If you have the figures in front of you, my last comments are based on two cartoons I drew for lay businessmen interested in commercialization.

Figure 1 indicates my rather simple cartoon as to how the administration works, and this is the wrong place for me to talk about how the administration works, but just the same, the bureaucracy runs, fortunately, on and on, and it is capped by the political appointees at the top.

The constant change, especially during a presidential election period, affects what I call the decision potential of the U.S. Government, shown on figure 2. This cartoon expresses in a relative way our experience during the last 8 years on attempting to get decisions or seeing decisions made regarding civil remote-sensing in the U.S. Government. Presumably it applies elsewhere, but this is our area of experience.

The peak under the Carter administration in November 1979 was the announcement of P.D. 54 after a lot of deliberation during that administration. It guaranteed four Landsat 4 thematic mapper systems, four Landsat D thematic mapper systems for 10 years to give us enough time to commercialize the system, or privatize.

Unfortunately, we went into that 18 period, which is shown as a dip on your figure, of the election year process and the adjustment to the new administration.

In 1981, after the inauguration of the Reagan administration, the OMB cut Landsat D′ and D″ and began its decision—decision potential, leading up to the current RFP process, which was intended originally for a—May 1984 decision on commercialization.

The Geosat Committee is extremely concerned that given the current uncertainties of the RFP process for Metsats and Landsat that we could severely damage the continuity of the Landsat civil remote-sensing programs as we go into the politics of the 1984 election year, as indicated by the dashed line on figure 2.

We strongly urge your committees to assist all of us in reaching a cooperative decision between government and the private sector to minimize the effects of this next election year and assure the continuity of a strong and ongoing civil land remote-sensing program in the United States.

Thank you.

[The prepared statement of Mr. Henderson follows:]

Sy3/2041A-1 B

STATEMENT OF DR. FREDERICK B. HENDERSON, III

PRESIDENT OF THE GEOSAT COMMITTEE, INC.

AT THE JOINT HEARINGS HELD BY

THE HOUSE SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE

RESEARCH AND ENVIRONMENT AND THE SUBCOMMITTEE ON SPACE

SCIENCE AND APPLICATIONS

ON LEGISLATION THAT WOULD GUIDE THE COMMERCIALIZATION

OF CIVIL LAND REMOTE SENSING

NOVEMBER 7, 1983

Mr. Chairman, I am pleased and appreciative of the opportunity to testify before the Subcommittees on behalf of The Geosat Committee on the issues related to the commercialization of civil land remote sensing systems and its potential impact on this country's growing dependence on global sources for strategic energy and mineral resources. Civil land satellites have proven over the past decade that they can provide useful information about the geology of this earth and assist in a better understanding of the global distribution of energy and mineral resources. Because a strong United States economy will always depend on access to such global resources, it is in the national interest to assure that civil land remote sensing systems are maintained, protected and caused to continually evolve through a commitment by the United States Government. Whereas commercialization may ultimately be the vehicle to obtain the optimum efficiency and usefulness of this technology. The United States Government must remain committed to assuring a strong United States Civil Land Remote Sensing program in its own self interest.

THE GEOSAT COMMITTEE

The Geosat Committee, Inc., is sponsored by approximately 100 U.S. and non-U.S. international oil, gas, mineral and engineering geological companies who produce more than half of this nation's non-renewable energy and mineral resources. This Committee is a unique industrial initiative to present to NASA and all other pertinent U.S. and non-U.S. governmental entities the considered professional geological recommendations of the nation's largest single industrial group of users of satellite imaging

data, a role which should continue to expand significantly. Since 1976, the Geosat Committee has worked diligently with various branches of NASA, the United States Geological Survey, France's C.N.E.S., Japan's NASDA and others in order to determine what supplemental remote sensing systems including Landsat would optimize the combined systems for geological remote sensing from space.

At our just completed 7th annual meeting in Houston, Texas, November 3-4, 1983, the Board of Directors and members in attendance reviewed the recent developments regarding the commercialization of civil land remote sensing, both in the Administration and in Congress. In my testimony today I shall try to incorporate the current thinking of the Geosat Committee on the issue and the impact of commercialization. The Geosat Committee strongly supports the recent positions taken by the Civil Operational Remote Sensing Satellite Advisory Committee (CORSSAC, previously LRSSAC) appointed by Secretary of Commerce Malcolm Baldridge and chaired by Michele T. Halbouty. In addition, your letter of 25 October 1983 to Secretary Baldridge was reviewed and The Geosat Committee share in principal the concerns you expressed therein.

THE COMMERCIALIZATION OF CIVIL LAND REMOTE SENSORS

Whereas The Geosat Committee believes that the eventual commercialization of part or all of civil land remove sensing systems is in the eventual best interest of the continuing development of these technologies we are very concerned that a premature effort to commercialize could in fact jeopardize or even cause their demise within the United States. While supporting commercialization in the long term, we, as the largest group of sophisticated industrial end users of the Landsat data don't really care who owns, operates, or develops these systems. What we do care deeply about is that a strong civil land remote sensing program be maintained in the United States and that it will continuously provide us with the right kind of data we need to compete worldwide for energy and mineral resources needed by the United States, her allies, and trading partners over the next few decades.

In order to maintain such a strong U.S. program, we will have to operate on cooperative basis between the private sector and government as our international competitors have learned to do. The current debate over commercialization has tended to polarize the interests of the government versus those of the private sector. We believe this is a wrong. Rather, The Geosat Committee believes that the commercialization process should be a means to an end: namely that of providing cooperation between the government and the private sector to create a strong and continuously evolving civil land remote sensing program in the United States.

In order to accomplish this goal, I should like to address several issues raised in your draft legislation specifically and in the current debate on commercialization in general.

COMMERCIALIZATION OF METEROLOGICAL SATELLITES

The Geosat Committee has no formal position on the commercialization of Metsats. Our prime objective is the maintenance of an ongoing strong Landsat program. Our concern is that, given the present mood in Congress to deny the commercialization of Metsats, the Landsat program does not suffer because of decisions regarding the Metsat programs.

CONTINUITY OF DATA

The Geosat Committee believes that the continuity of a strong and continuously evolving civil land remote sensing program is of vital importance to the United States. We believe that this is true whether this program resides in the government, the private sector, or both.

We do not share the commitment of some and also expressed in your draft legislation, that the ongoing programs must maintain a multi-spectral scanner (MSS) base line. We would prefer to see the program evolve as the technology evolves. From the point of view of many of the more sophisticated Geosat users, the MSS is both antiquated and redundant with respect to the thematic mapper (TM). Basic MSS-type data can be produced on board the spacecraft from the TM system. We therefore believe the U.S. base line should be the TM. Our basic goal for the 1980's is to acquire at least a one-time global data set of TM data and the maintenance of continual TM-type data programs for the near future. If this requires one or more Landsat TM satellite systems, then we would support further Landsat TM satellite development. We applaud the recent Administration and Congressional actions to move up Landsat D'(5) to a March 1984 launch to replace the unfortunately ailing Landsat 4.

In order to fulfill our goal of at least one TM global data set, and in agreement with this Administration's original decision to allow two Landsat D/TM systems to develop the required market for commercialization, the Geosat Committee strongly supports the July 29, 1983 Halbouty CORSSAC recommendation to push forward now for the early lead items for Landsat D" and an early government commitment to fly Landsat 6. This appears to be the only way to avoid a TM Landsat 3-year data gap built into the current Request for Proposal (RFP). This 3-year data gap would, in our opinion, be disastrous to the development of an on-going civil land remote sensing program in the U.S. Furthermore, it would ensure our dependence on non-U.S. data sources, if available, and would stifle for many years to come the currently stalled upgrade and development of foreign ground receiving station capabilities to acquire, archive, and distribute Landsat TM data around the world.

Because the OMB appears to adamantly oppose continuing the Landsat TM program beyond Landsat 5, The Geosat Committee urges Congress to take the leadership in protecting the U.S. program and providing continuity of data until such time as a realistically commercial system can evolve.

FUTURE RESEARCH AND DEVELOPMENT

In order to maintain a strong, continuously evolving U.S. civil land remote sensing program, the United States government must revitalize and commit to continued high-risk, exploratory sensor and applications research and development. Historically this type of R&D can best be done only by the government. In the case of civil land remote sensing, this is particularly true of the past accomplishments of NASA.

Without such continued R&D, it will not be possible to design future civil land remote sensing systems capable to maintaining U.S. leadership or even parity with the burgeoning remote sensing technologies developing outside the United States. Remote sensing examples are many. Several years ago, I testified a number of times before your Space Committee regarding the need to develop a high spatial resolution, Landsat compatible digital stereoscopic satellite called STEREOSAT. Because of the inability of the Administration, the House, the Senate and the private sector to agree on who was being served and who should pay for such a system, as Americans, we all lost. As a result, a French-led European built system will fly a better system known as SPOT. Similarly, because of recent decisions of the U.S. government not to cooperate on some joint space developments, under the auspices of protecting U.S. technology transfer, the Japanese will build in Japan probably the best synthetic aperture radar yet for their JERS-1 satellite in 1990. Also, the Germans have commissioned an in-house development of solid state sensors for their MOMS project which may fly before comparable U.S. sensors on a commercial basis.

If the U.S. is committed to the continuity of civil land remote sensing, then the government must take the lead in providing high risk exploratory R&D for sensors and applications. Military R&D in this area will not trickle down fast enough for the civil community to compete internationally. Private sector R&D is generally not high-risk exploratory R&D leading to new systems. In addition, it is usually proprietary and goal oriented in a non-commercial mode. It is in the national interest for the public good for the government to maintain future R&D programs to maintain ongoing, and continuously evolving, internationally competitive civil land remote sensing systems in the United States.

"OPEN SKIES" POLICY

The Geosat Committee supports the position expressed in your draft legislation and your letter to Secretary Baldridge regarding "Open Skies" policy. We believe the U.S. and the rest of the world have benefitted enormously from the "Open Skies" policy set forth and maintained by the United States for over the last two decades.

As international explorers for global energy and mineral resources, global data and information derived therefrom are vital to the success of our efforts. International cooperation on the exchange of civil land remote sensing data appears, except from the Soviet Union point of view, to be the only logical economic path to follow. International cooperation on the development of complimentary and compatible civil land remote sensing satellite systems and ground receiving stations is paramount to the sensible development of global civil systems. If, for whatever reason, the principal satellite producing countries should turn away from the "Open Skies" policy, then the world risks an expensive, proliferating "intelligence arms race" to develop nationalistic remote sensing satellite systems to further compete for world resources. It is our belief that maintenance of the "Open Skies" policy of open, internationally cooperating systems is the only way of assuring that land remote sensing satellite systems will remain in the international civil community in the best interest of all.

The Geosat Committee believes that there is no inherent incompatibility of the "Open Skies" policy based on non-discriminatory access to date. Under any realistic commercial proposal to date, proprietary rights to data under current international copyright laws is required to protect the commercial entity's investment. While not lawyers, it is our understanding, through various legal standards of "group shoot" type of data purchase and non-exclusive data sharing that both the concepts of "Open Skies" policy and reasonable commercial control of data and especially information derived therefrom can be mutually satisfied.

THE VALUE-ADDED INDUSTRY AND COMMERCIAL MARKET DEVELOPMENT

Closely related to the "Open Skies" issue of non-discriminatory access to data, is our mutual concern of protecting the development of the value added industry and its role in creating the real market necessary to commercialize the civil land remote sensing.

As indicated in the submitted value-added industry paper, we generally believe that without the development of a strong international value-added industry to serve the many levels of user requirements, that a true market sufficient to commercialize a Landsat type program will not materialize in sufficient time to compete with other developing international systems. The Geosat Committee generally believes that it is the value-added industry

which clearly can expand and become commercial now. This is especially true if the government is removed from the data handling process. It is even more true if the government would attempt to state its real data requirements as opposed to its unreal position in the current RFP process that the U.S. government has no Landsat requirements. While that position may satisfy OMB, it does not assist in any meaningful effort to commercialize.

The Geosat Committee supports the Halbouty CORSSAC position that the value added industry is best protected by making non-discriminatory access to the government and/or private sector data stream at the "raw data" format. We agree with your proposed legislation on this point of access to "unprocessed or minimally processed" data. We also strongly believe that this type of data or perhaps selected computer compatible tapes (CCTS) derived therefrom should be archived in a government supported National Archive.

Commercial entities in the value-added industry obviously should retain proprietary rights to the downstream value-added data and information derived from the "raw data." The Geosat Committee is mixed on whether a selected owner-operator of the satellite system should be allowed to compete in the value-added industry. However it would probably be generally acceptable if stringent "raw data" non-discriminatory access was guaranteed by legislation such as yours so that no undue advantage accrued to the data stream owner-operator.

Commercialization of the ground segment value-added industry as begun and is clearly the first viable segment to transfer to the private sector as part of a phased transition commercialization of civil land remote sensing. In this context we agree with your October 25, 1983 letter expressing concern regarding the restrictiveness of the RFP requiring bids only on total systems (space and ground segments). We believe that a market driven strong value added industry capable of providing multi-level products to a multi-level use community is a paramount requirement to the eventual successful commercialization of the civil land remote sensing program in the United States.

LANDSAT AND ORWELL'S 1984

Figures 1 and 2 are simplistic cartoons prepared for lay businessmen interested in commercialization. Figure 1 indicates my simple explanation of how our administration works; a large bureaucracy capped by relatively few but forever changing group of political appointees at the top. While the significance of these changes at the top is debatable, their changes especially affect the U.S. government decision potential (DP) as shown on Figure 2. This cartoon in a relative way expresses our experience over 8 years of the potential for a government decision and implementation in the field of civil land remote sensing. The peak of the Carter Administration was the announcement of P.D. 54 to privatize

the Landsat program guaranteeing four Landsat TM satellites for the 1980's to provide a 10 plus years coverage to allow for privatization (commercialization).

But subsequently an 18 month low of DP occurred during the 1980 election year and 1981 adjustment to a new Administration and Congress. The Reagan Administration, beginning with the 1981(2) budget decision to lop off Landsat D" and D'", began its uphill DP course leading to the current RFP process intended originally to result in a May 1984 decision on commercialization.

The Geosat Committee is extremely concerned that, given the current uncertainties of the RFP process for Metsats and Landsat, that we could severely damage the continuity of the Landsat civil land remote sensing program as we go into the politics of the 1984 election year, as indicated by the dashed line of Figure 2.

We strongly urge your committees to assist us all in reaching a cooperative decision between government and the private sector to minimize the effects of the election year and assure the continuity of a strong and continuing civil land remote sensing program in the United States.

FIGURE 1.

U. S. GOVERNMENT ADMINISTRATION

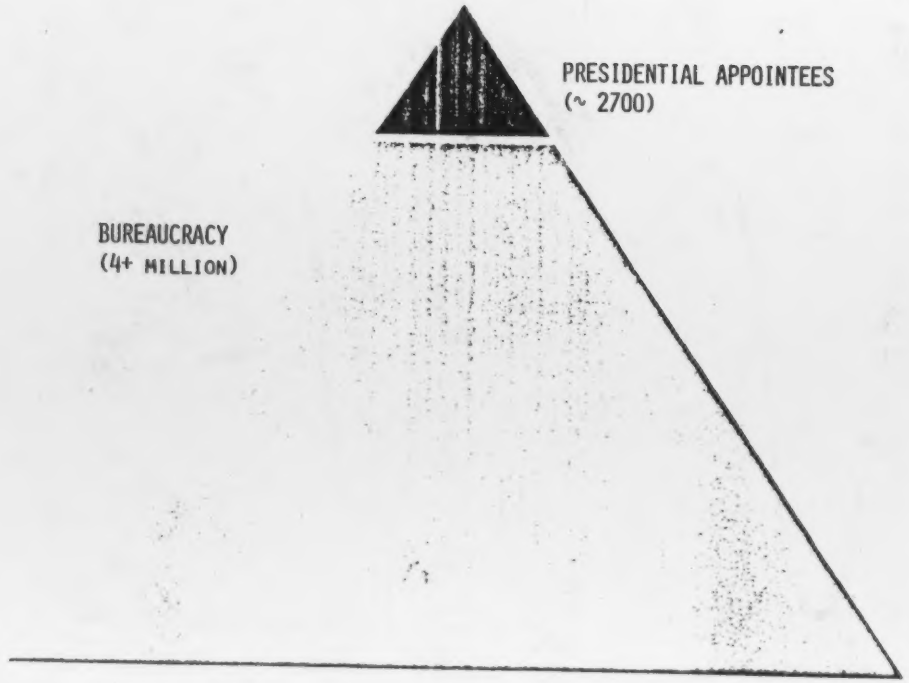

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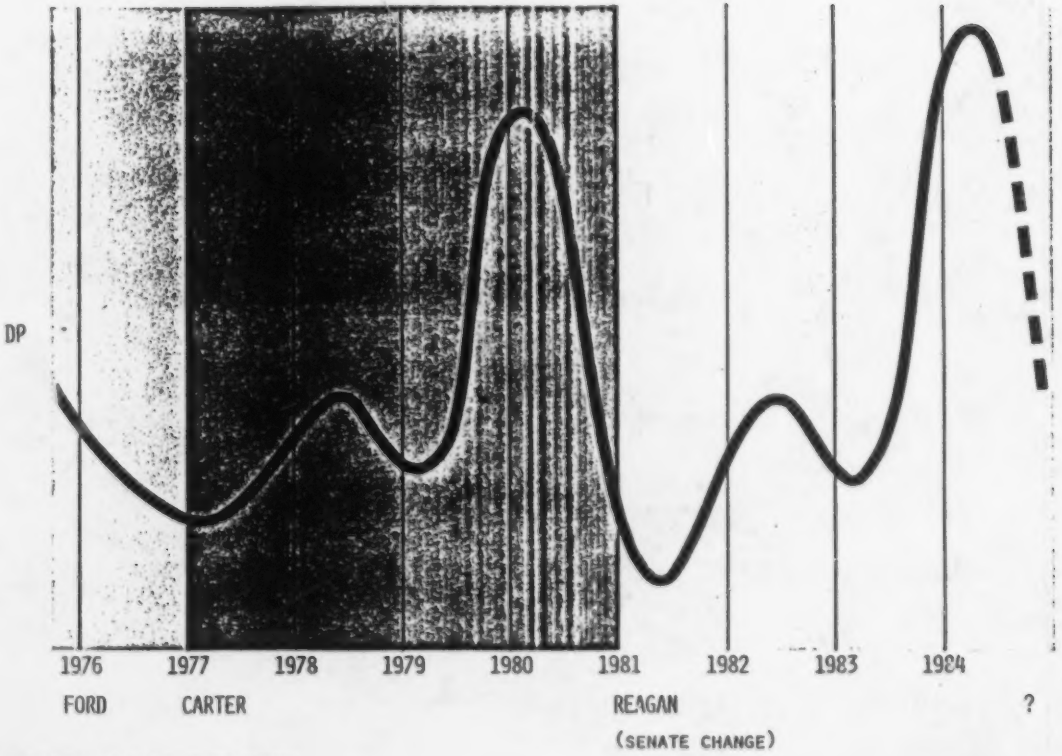
FIGURE 2.

U. S. GOVERNMENT DECISION POTENTIAL (DP)
(GEOSAT EXPERIENCE)



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Mr. VOLKMER. The gentleman from California. Do you have any questions of this witness?

Mr. BROWN. None at this time.

Mr. VOLKMER. All right.

The gentleman from New Mexico.

Mr. LUJAN. Yes, Mr. Chairman.

Are you saying that the approach that we're taking of piecemeal commercialization, that maybe—that the Government continue the research function in getting all the best data that we can in whatever way we can, but that the marketing might be all right to go ahead and commercialize?

Mr. HENDERSON. We certainly support the fact that the Government is the best-equipped to do the high-risk exploratory R&D for future systems and it belongs in the Government in our opinion.

Mr. LUJAN. Forever?

Mr. HENDERSON. I don't think that the military or the private sector will ever do the kind of research that would be required to build systems to compete internationally with other developing systems.

Mr. LUJAN. But you're saying that we ought to concentrate, instead of the multispectrum, that we concentrate on the thematic mapper, for example, that just target into one. Don't you think that the private sector, if that's what you will buy, will do because they're cheaper to build, I would imagine? Single-purpose data acquisition satellites?

Mr. HENDERSON. Well, I think that we—we believe that Landsat 1, 2, 3, MSS data and Landsat thematic mapper data, like Ford T and A models, there are many, many more better systems that will come down the road, but they're expensive to R&D and build and determine how to build the systems and what the applications are.

That cannot be done solely by industry and Government has to play an important role in that R&D.

Mr. LUJAN. Do you pay the Government now for the data that you get?

Mr. HENDERSON. We pay taxes. [Laughter.]

Mr. LUJAN. No, I meant——

Mr. HENDERSON. For the R&D?

Mr. LUJAN [continuing]. Is that kind of an objection that you have to pay for the data that's acquired?

Mr. HENDERSON. Well, I only halfway laughingly say that comment, because many people——

Mr. LUJAN. I understand what you're saying, sure.

Mr. HENDERSON [continuing]. I represent feel that——

Mr. LUJAN. But you get more benefit out of it then—than I do directly. I do, in the final analysis, if you want to talk about——

Mr. HENDERSON. Sure.

Mr. LUJAN [continuing]. You know, as a citizen and all of that. I eventually get the—get the benefit because you might be able to—to get more oil and, therefore, the oil is going to be cheaper and all those sorts of things. But going in, as a company, you would get more benefits than I would.

Mr. HENDERSON. Well, I think you have to look——

Mr. LUJAN. And you're generalizing, and I'm trying to bring it down——

Mr. HENDERSON. Sure.

Mr. LUJAN [continuing]. More to specific.

Mr. HENDERSON. Sure, sure, we benefit from the R&D. Of course we do. But I think——

Mr. LUJAN. No, no, from the data that is supplied to you and should you pay for that and then pass it on to me because I'm going to pay for it in the final analysis if we're going to generalize it, but pay for it going in and that's what we're looking at in the commercialization, really.

Mr. HENDERSON. Well, I think that in some of the written testimony I referred to something we did here in this room for 3 years and the last administration on the thing called Stereosat and we tried to get—convince the U.S. Government that it was in the interest of the U.S. Government and its industry to build a high-resolution stereo system called Stereosat.

The impasse between the House, the Senate, the administration and the private sector over who would be served and who ought to be paid caused us to lose that battle. It was never built, so we will add from the French. We're going to build a SPOT system and fly it in another year.

Mr. LUJAN. Yeah.

Mr. HENDERSON. I think it's in our mutual benefit to do both in the terms of R&D in the development and how we work out who pays for it. The important point, that is, is that we both benefit.

Mr. LUJAN. Well, back to my original question, would you have an objection as an organization to the commercializing of the marketing segment only——

Mr. HENDERSON. Absolutely not. We think that's timely and I think we are ready for that. I think——

Mr. LUJAN. Thank you, Mr. Chairman.

Mr. HENDERSON [continuing]. That will lead to whatever is going on with the satellites in the future.

Mr. LUJAN. Thank you, Mr. Chairman.

Mr. VOLKMER. Before proceeding on with additional questions, I think I'd like to have Mr. Walklet proceed with his statement and your statement, too, will be made a part of the record in full and you may either summarize or review it in total, however you so desire.

STATEMENT OF DONN WALKLET, PRESIDENT, THE GEOSAT COMMITTEE, INC., SAN FRANCISCO, CALIFORNIA

Mr. WALKLET. Mr. Chairman, it is a pleasure and an honor for me to address you today concerning the future commercial opportunities for satellite remote-sensing technology as they relate to our—to your proposed legislation.

Many distinguished individuals have preceded before me on this and other occasions discussing the value of remote-sensing data to their profession. I shall not even attempt to duplicate their praise of the Landsat program or to repeat their request for continued Government support of this program.

It is my intention to present a brief summary of my research into the significant commercial market for satellite remote-sensing data, to relate this potential to the current revolution in information technology, and to outline the significant negative or positive impact legislation can have on the commercialization process.

I would like, then, to make a few major points in the next few minutes. My written testimony elaborates upon each of these in greater detail.

First, remote sensing has a significant future commercial potential if its transfer from the Government to the private sector is managed correctly, and in turn, I can build upon what Fred Henderson has just said in terms of the lack of continuity in terms of policy and decisionmaking in terms of how this affects what goes on in the private sector.

Satellite remote sensing established through Government research has never been adequately positioned by the Government as a commercial technology. There is a significant requirement for resource information by the worldwide business community which can be satisfied in the future by information, and I emphasize information products, with a substantial satellite remote-sensing data input.

Of particular importance in stimulating the growth of this field will be certain already established trends and developments in the computer industry and the computer services industry, and this is outside of what goes on here in the Government and in the Government and research community. These are trends which are already established within the private sector.

The market for remote-sensing hardware, software, consulting services and data could exceed $12 billion by the year 2000, according to the research that my company has done. Credible foreign competition, utilizing the fruits of U.S. research programs, has already declared its intention to assume a major role in this market by the end of the decade, a role which could lead to technological and market dominance unless remote-sensing technology is aggressively commercialized within the United States now.

The value-added service community is the key to the development of the resource information market, but the value-added companies will establish their presence and prosper, utilizing whatever source of data is available, be it foreign or domestic.

Customers will benefit from the privatization of remote sensing if free-market conditions prevail. In other words, if service—their service will improve, the price will ultimately drop and a greater variety of products will be available.

A transition from Government to private ownership of remote-sensing facilities based on guaranteed Government markets could very well undermine the natural inclination of business to compete and thus to provide the best possible services to data users, whether they be Government or private users.

Technology is now available to address both the efficient gathering, processing and distribution of remote-sensing data to the extent that a profitable, fully integrated industry could be established within the next 5 years.

There is a significant element, both within the Government and among Government contractors who would prefer to maintain the status quo and thus belittle the commercial potential of remote-sensing technology. On the other hand, there are sophisticated businessmen and technologists within the private sector besides those in the major aerospace companies, who are fully capable of

addressing this opportunity aggressively in a free-market environment.

The investment community can and should play a critical role in the development of commercial remote-sensing industry, provided there is favorable economic and political climate. Neither entrepreneur nor investor can deal with the limitations and constraints imposed by the current Department of Commerce RFP and with any of the previous legislation proposed to date, or with the general state of chaos which this debate has created.

Having made these points, let me say that the proposed legislation from your group represents the best effort I have seen yet to address the issues of satellite remote-sensing commercialization, but it does not go far enough.

The Government, through the Secretary of Commerce, intends to implement a policy which will maintain the continuity of remote-sensing data and this is to be applauded. However, the award of contracts as proposed under section 302 and also under the RFP, in fact, assumes that the Secretary of Commerce in the short term can make a better decision than the marketplace in matters relating to the competency, flexibility and overall suitability of potential contenders based on a written proposal.

If past history is a reliable indicator, large existing companies will be the least responsive contenders in a new market. The companies that will dominate this industry in the future do not even exist today.

The Commerce Department RFP and the proposed legislating emmanating from the joint committee initiative leave little room for any new and creative enterprises. The ground rules are such that the winner of the currently proposed competition can only be a large established company. The elements of true competition in the marketplace where a success is judged on bottomline performance are absent.

Sections of this legislation dealing with award of contracts should be replaced with provisions for economic incentives, such as investment tax credits and accelerated depreciation. To benefit those investors who are willing to take the risk at this time, take the risk with their own capital on the strategies of aggressive and market-oriented businessmen, a value-added service industry is critical to the growth of a remote-sensing data market.

Some of the best potential initiatives for lean and creative programs for data acquisition operations could evolve from this community. The issue of the—the issue of the legitimacy of connections between the value-added companies and the entity which is acquiring the data can be addressed by proper legislation.

However, a data acquisition company, arising out of the value-added community, will seek to maintain the respect and cooperation of its potential value-added customers while still maintaining its contact with the ultimate end user.

The issue of "open skies" and nondiscriminatory access to data becomes a moot point in the evolution of this technology into a healthy, market-oriented industry. The only way to make remote-sensing profitable in the long term is to greatly expand the current limited user base.

By our own estimates, less than 1 percent of the potential market has been penetrated. The limited access would only frustrate initiatives to expand the market while the flexibility of the next generation's sensor technology could make such a strategy irrelevant.

The future customer will have extremely wide—will have an extremely wide range of options in terms of the quantity, quality and price to choose from for the next generation data products. Thus, the proprietary quality of future data will not be in the act of acquisition, but in the chosen mode of acquisition and the method of processing.

Legislation on this issue may only be necessary to soothe the fears of those who do not understand how this industry will evolve.

Any and all regulation of remote-sensing data acquisition services should be limited to frequency allocation for satellite systems and safety and financial liability.

Finally, endorsing the provisions of section 608(c) of your proposed legislation, I believe Government agencies should be held financially responsible for all losses incurred by a domestic remote-sensing data acquisition service due to arbitrary controls or regulatory conditions imposed by those agencies.

In summary, remote sensing is a subset, but also the leading edge of the much broader issue of space commercialization. The business and investment community needs to see some sign from the administration and the Congress to indicate that the issue of space commercialization is going to be given the necessary push toward operational reality.

Technology which was born within the Government R&D environment needs to be given a reasonable transition into the private sector where it can prosper. Attempts by the Government to manipulate its growth will only stifle progress and leave the door open to foreign competition.

Tax incentives established at this time will stimulate the transition process, will rapidly establish new commercial sectors in the economy, and will return additional tax dollars, as well as efficient services to the Government as early as the end of this decade.

Thank you.

[The prepared statement of Mr. Walklet follows:]

Sy 3/2041A-2

REMOTE SENSING OF EARTH RESOURCES AND THE ENVIRONMENT: THE TRANSITION TO COMMERCIAL OPERATIONS

Submitted to the

SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS

and

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT

Joint Hearing on Legislation and Commercialization of Civil Land Remote Sensing

Prepared by

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President
Terra-Mar
2113 Landings Drive
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(415) 964-6900

November 8, 1983

Mr. Chairman and members of the Subcommitttee on Space Science and Applications and the Subcommittee on Natural Resources, Agriculture Research and Environment, it is a pleasure and an honor for me to address you concerning the future commercial opportunities for satellite remote sensing technology as they relate to your proposed legislation. Many distinguished individuals have preceded me on this and other occasions discussing the value of remote sensing data to their profession. I shall not attempt to duplicate their praise of the Landsat program or to repeat their requests for continued government support of this program. It is my intention to present a summary of my research into the significant commercial market for satellite remote sensing data, to relate this potential to the current revolution in information technology, and to outline the significant negative or positive impact government involvement can have on this process. This statement provides additional background information in support of my oral testimony.

Introduction

The government, through the NASA Landsat and the NOAA Metsat programs, has contributed significantly to the future economic potential of satellite remote sensing. In spite of this contribution, however, an unfortunate lack of understanding has developed concerning the context in which remote sensing fits into a commercial environment. In NASA's sphere of operation, remote sensing is primarily an aerospace technology. But in the commercial world, remote sensing is a computer and information technology and it should be packaged and marketed accordingly.

Of greater significance, however, is the fact that remote sensing has not been positioned by the government as a potential commercial technology; therefore, it has remained unnoticed by the financial community. Specifically, no government agency has ever conducted market research to define the true potential of an information system based on real-time data acquisition from a network of geosynchronous and low earth orbiting satellites. To a great extent, knowledgeable private sector groups understand that the potential gross revenues derived from all components of an earth resources and environmental data industry can be numbered not in the millions, but in the billions of dollars annually. This is an estimate that has become specifically recognized by prospective foreign suppliers of remote sensing data.

The research conducted by my company has revealed that the future revenue from appropriate satellite sensors is directly tied to growth associated with the next generation of computer services. In this context, digital satellite imagery will be a valuable source of input into earth resources information services. Within the private sector, the infrastructure for this service capability is now in the development stage. Highly refined applications software for converting imagery into information will soon greatly expand the current limited user base. Furthermore, computer networks and distributed processing will

provide convenient access to new markets for specialized earth resources data bases. This is a factual not a speculative scenario that is based on generally accepted trends which are fundamental to all computer service companies.

Assessing the Potential Market

Previous government studies have at best defined the value of satellite remote sensing in terms of a "cost-benefit" analysis using techniques inappropriate for assessing future high-technology markets. Specifically, the mechanism for gathering information about the future user community -- the market survey -- has misrepresented the substantial potential of an earth resources information industry. The market survey can be a very useful tool in predicting sales figures, depending upon how the information is gathered and how it is utilized. In the case of past surveys of users of remote sensing data, the general questions have been along the lines of "...how would you use remote sensing data", "... how much remote sensing data would you buy", and "...how much are you willing to pay for remote sensing data". The absurdity of such questions can be put into some perspective if one considers how a "potential customer" for computers or plain paper copiers would have answered similar questions in 1950. Most people cannot even begin to imagine how remote sensing data could relate to the way they do business or to how they make decisions.

In order to correctly assess the potential market for remote sensing "information" -- that is, highly processed and refined remote sensing data -- one must ask questions which relate to how people use any type of earth resource information in their business and how critical this information is to their decision making processes. This type of information could be as seemingly mundane as a newsletter from the state fish and game department or the morning weather, livestock, and commodities report on the local television news. It could also be as expensive and complex as a $100,000 per year crop forecasting service received daily by a commodities brokerage business. Each use of information is extremely significant for the forecasting of the market for remote sensing derived products. Even this market research is irrelevant if put into a market forecasting model which does not account for the real world environment. In the case of forecasting remote sensing information markets, models which do not include industry concentration (revenues per establishment), user sophistication (ability to utilize and adapt to computer generated products), and technology leverage (growth of computer generated services) should be considered useful to the academic economist but otherwise useless in a commercial environment.

Unfortunately, such an incorrect market forecast analysis has been generated from statistics concerning current sales of Landsat data by the EROS Data Center. Sales of products from an R & D system in a format not readily interpreted by the "masses" does not constitute the basis for accurate market projections.

In evaluating market potential, Terra-Mar has assessed the gross requirements of users for all forms of renewable and nonrenewable resource and environmental information in terms of operating revenues which are specifically affected by the availability of that information. Thus, an oil company managing a 1 billion barrel offshore oil field may spend $500,000 per year for wave, current, and meteorological information derived from satellite data and associated value-added services. Or, 10,000 commodity brokers may each utilize $50 worth of a commodities information service in making trades equaling $50,000,000.

Based upon the availability of appropriate remote sensing data, earth resources and environmental information services will eventually penetrate and expand these current markets with improved products. Projecting the growth and development of such a business becomes a function of quantifying the size of that potential market and then calculating rates of market penetration based on historically documented algorithms for comparable technologies (namely, those based on computer and communications technology).

Terra-Mar's market projections derived from analyzing these marketing and technological trends provide the basis for pursuing commercial satellite remote sensing services. These projections assume an aggressive marketing environment -- one that is unregulated and very competitive. In fact, the consumer is best served in such an environment. Consumers will not just be oil companies or the government but all individuals seeking information about the earth, its atmosphere, and its oceans. Under such commercial circumstances, concerns over "open skies" will be overcome by market growth which will, in turn, be stimulated by new applications software and modes of delivery and be driven by the opportunities to expand distribution to all levels of society.

The Leverage of Improving Technology

To a great extent, growth in the markets for earth resources and environmental information will be made possible by advances in semiconductor and computer technology. The growth in the sales of personal computers from zero in 1976 to over $6 billion in 1983 is indicative of a trend towards less expensive, distributed computing which will shape the marketing strategies for computer services in the future. In essence, the personal computer has created a mass market for software and data services on an individual level. Like the scientific hand-held calculator of the last decade, a high percentage of scientists, engineers, and businessmen will own a desktop personal computer to use in their day-to-day decision making process. It will not be a luxury but a necessity.

In this marketing context, earth resource and environmental data will become an important component of the future information revolution. Terra-Mar has determined that a substantial proportion of important decisions made by the business community are

related to having accurate information about the earth's resources or its environment. Improving the raw satellite imagery with value-added services -- essentially, customizing the data to user needs -- will make remote sensing data a strategic element of the future decision making process of international business.

In addition to advances in computer technology, the next decade will see improvements in the methods of deploying orbiting earth sensors. More reliable, interchangeable, and thus less expensive sensor components will be operated from space platforms such as the Fairchild Leasecraft and the MBB SPAS. On these platforms, scheduled maintenance and repair will prevent the costly loss of satellite sensor systems, as previously experienced with Seasat and the current Landsat 4 situation, for example. The requirement of efficiency and economy will replace the "gold-plated" specifications generated by the previous era of NASA R & D sensors.

Concerns of the Consumer

It is quite natural for the current users of resource and environmental data from the Landsat and NOAA satellite systems to be concerned about privatization of these programs. What will be the quality of service? What data products will be available? Will data prices rise significantly? There are no specific answers to these questions at this time. However, it may be presumed that the private companies are consciously getting into this business to make a profit -- a motive that should not necessarily concern the consumer. In other words, the prudent businessman will attempt to provide good service and the appropriate product mix at an appealing price in order to stimulate the use of his product. Thus, the sale of environmental and resource data will be stimulated by a business framework oriented towards both creating a market and satisfying it to the maximum extent feasible.

The consumer should be concerned, however, about any suggestions of a government "subsidized" transition to private ownership, including guarantees of government markets. This situation would likely undermine the natural inclination of a business to compete and to provide the best possible service. The federal government will be a major customer whose patronage can be assured only if the quality of service and product meets necessary specifications. The wise businessman will exceed those requirements and provide services beyond those expected by his customers, whether they are in the public or the private sector. The small user of data will also be accommodated under free market conditions by a range of products that will meet his needs for quality data at a reasonable price. It is only necessary to observe comparable trends already established in providing data base services to individuals through their personal computers to understand the profit potential associated with meeting the needs of the "little guy".

The research scientist will be comparably rewarded within a private resource and environmental satellite framework. Understanding natural phenomena through satellite imagery is a fundamental step in stimulating the future use of satellite systems. Thus, the university research community will be actively pursued and supported based on their ability to provide an understanding of what present satellite sensors can observe and to suggest options for future sensor design and operation. Examples of such coordinated and synergistic relationships currently exist between the private sector and the academic community. Medical research in universities is actively supported by the pharmaceutical industry, as is research into geophysical phenomena by the oil industry.

Approaching the Investment Community

Unfortunately, the investment community has not been well informed about the commercial opportunities regarding utilization of remote sensing technology. Government officials have not only failed to educate Wall Street but have also failed to understand how private investors can play an important role in developing this strategic technology. Investors are guided by some very simple rules in evaluating prospects for placing their funds.

First, is the technology far enough removed from research and development that there is small risk of technical surprise along the path to the marketplace? Second, is this a market with substantial opportunity for long term growth? Third, after considering development and operating costs, are revenue projections sufficient to provide adequate return-on-investment (ROI) in comparison with other investment opportunities? And fourth, is there minimal near and long term risk of the type of government regulation that could inhibit earnings growth? In other words, are we dealing with a politically benign technology?

Ten years of successful R & D in Landsat and related environmental satellite programs should provide the basis for initiating commercial remote sensing ventures with little threat of technical uncertainties or unknowns. Solid state sensor technology will minimize many of the risks of mechanical sensors, while improved modes of deployment such as SPAS and Leasecraft (with retrievable buses) can minimize the risks of on-orbit failure.

Discounting the inadequate government evaluation of remote sensing generated information markets, private studies such as those prepared by Terra-Mar adequately document the potential of a market for products and services primarily generated from the availability of appropriate remote sensing data. Paralleling other computer generated information service markets, this business should generate approximately $12 billion in revenues (in constant 1980 dollars) from sales of data, computer hardware and software, and value-added services by the year 2000. Such rapid-

ly growing and sustained market opportunities are currently highly valued by the investment community.

Thus, the projections for revenues and profits become equally appealing as costs decrease with improved computer and sensor technology, while progress along the "learning curve" creates well defined methods for decreasing unit cost for data generation. Subsequently, remote sensing will follow the trend of other computer technologies as near term dominance of hardware sales is rapidly displaced by requirements for software and then raw data, as the market becomes more broad-based and sophisticated in its utilization of available products.

This leaves the fourth factor -- the issue of politics -- as the remaining unknown and the single issue which could inhibit commercial development of remote sensing products and services. The current controversy over the disposition of Landsat 4 and the environmental satellites poses a serious problem for the business community to overcome. Specifically, Landsat 4 is encumbered with technical and political problems which make its transfer to the private sector rather complex. The original value of the satellite and related data processing assets is significant; however, on the open market, that level of technology is considered obsolete. Given the computer technology which is available today and which will make another substantial leap by 1984, Landsat 4, primarily oriented for R & D applications, could be considered in financial circles to be a commercial liability. There is also a negative stigma associated with "Landsat" as a commercial concept. The entire process of "analysis" has politicized Landsat to the extent that the financial community views Landsat with a certain skepticism -- it is expensive, unreliable, and may entail unknown political traps.

Nevertheless, Landsat 4 does represent a significant contribution to our understanding of the technology associated with developing viable commercial information products. The addition of the Thematic Mapper to Landsat 4 has provided new insights into the potential usefulness of satellite resource surveillance. However, Landsat 4 is not configured to be an operational satellite system, and no investor who is seeking to compete in an open marketplace would consider owning that system. The government's preoccupation with "selling" Landsat and NOAA satellites has missed the true objective of promoting satellite remote sensing as a viable commercial technology. Emphasis should be placed on creating incentives for investment in the next generation of reliable and efficient satellite sensing systems, rather than on unloading the product of past R & D programs.

In order to maintain objectivity and impartiality, the government should utilize Landsat 4 and the current NOAA environmental satellites as a tool to stimulate the development of a private earth resources and environmental information industry. At this point, it would be very difficult to designate one company to assume the operation of Landsat with the subsequent responsibility for developing the market. Terra-Mar research

indicates that such a company with the appropriate operational and marketing skills does not exist. However, within the next five years, new companies or a consortium of companies will develop that will have the skills to assume these responsibilities in the long term.

In the meantime, improvements in data processing and data distribution will stimulate the groundswell of value-added activity which is already occurring, thereby increasing revenues from satellite data sales as new applications become entrenched in the market place. Strength among private sector operators will eventually permit backward integration into data receipt and archiving as well as the development and operation of orbiting sensors. In this mode, healthy competition will encourage the creation of new applications software as well as encourage the companies with the best capabilities to assume a leadership role in developing a fully integrated earth resources information system.

In this frame of reference, the investment community can properly interact with those private companies, objectively evaluating the strengths and weaknesses of various competing concepts, evaluating their management's strategic planning skills and knowledge of the market, and putting each to the ultimate test -- looking at the "bottom line". The government should not compete with Wall Street in making these decisions. The government's self-interest, as probably the largest single customer for earth resources information services, will be best served by letting the marketplace determine which companies are best qualified to own and operate remote sensing satellite systems for the good of mankind in the future.

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Donn Walklet is the president of Terra-Mar, a company located in Mountain View, California, that is currently involved in analyzing policy issues relating to and the market potential of various space activities. Terra-Mar's findings in this area could result in the financing and development of those concepts with the greatest commercial opportunity. Prior to founding Terra-Mar in 1976, Mr. Walklet received a Masters in Business Administration from Harvard University and a Bachelors of Science in marine geology from Stanford University. Between degrees, he flew as a reconnaissance pilot for the U.S. Navy utilizing sophisticated optical and acoustic sensor systems. He currently represents the commercial viewpoint of investors on the Land Remote Sensing Satellite Advisory Committee reporting to the Secretary of Commerce.

Mr. VOLKMER. Thank you, Mr. Walklet.

The gentleman from Virginia have any questions?

Mr. BATEMAN. Yes, Mr. Chairman. If I may, I would like to address a question to Mr.—Dr. Henderson, if I can find the statement that I marked. Yes.

In your written statement, you say that while you and your group are not lawyers, it is your understanding through various legal standards of "group shoot" type of data purchase and nonexclusive data-sharing, that both the concepts of "open skies" policy and the reasonable commercial control of data and especially information derived therefrom, can be mutually satisfied.

Would you comment on the reasons for that conclusion, that those concerns can be reconciled?

Mr. HENDERSON. What I was referring there to is a standard—or series of standard ways of operating in the petroleum business of acquiring data by a limited number of people and yet sharing it on a nonexclusive basis ultimately. This does not necesssarily fit precisely with the wording in your legislation where you say there can be no fiscal differentiation between users, but it does work very well in our industry where people put up money, up front. The "group shoot" term comes from the original seismic type of exploration where a group would shoot dynamite, get the data and share it and then sell the data later on to their own competitors when they no longer needed it.

There are many, many different ways of doing that and we see no reason why if you commercialize a system and require that copyright and proprietary—which require proprietary ownership of data purchased or leased information purchased from a system—that that cannot also be shared on nonexclusive basis by a later buy-in by governments or anybody else who wishes to buy into it. So the "nonexclusive" is a key word, I think, rather than "exclusive."

Does that answer your question? I'm not a lawyer.

Mr. BATEMAN. Well, I just used to be, but really it is not so much a legal question for me as it is a conceptional question and a problem with the "open skies" concept. Under "open skies," it has a connotation of the data is routinely available to foreign governments, to foreign individuals, the raw data.

If you're going to commercialize, aren't you—is there any implication that you've got to deviate from the "open skies" policy and that if it's going to be a commercial—commercially viable operation, that you're going to have to have a proprietary interest in the raw data and any in-house treatment of that data?

Mr. HENDERSON. If you're going to—if you're talking about commercializing the space segment, that is, the data-requiring system, then clearly whoever owns that must have proprietary rights to that system. However, we believe strongly in the "open skies" policy and nondiscriminatory access to that data. So there are many—and again, I'm not speaking from an area of expertise here, but there are many established ways which that can be licensed and resold to anybody who wants to buy it.

Again, the key word would be "nonexclusive" access or "nondiscriminatory" access to that data at some point. If the Government is going to continue to maintain the system, or the private sector,

as suggested by—in the studies of the Halbouty committee, the point is that there would be nondiscriminatory access to the raw data. Now, that would cost people something for return on investment.

Mr. BATEMAN. In other words, you're saying that as long as it were uniformly available and at the same price, then it would not violate "open skies."

Mr. HENDERSON. Yes, sir.

Mr. BATEMAN. To the extent that it, in the practical context, might do so, it would simply be that some people just couldn't afford to pay whatever the prevailing price in the marketplace might be.

Mr. HENDERSON. That's certainly a distinct possibility, but I think that anybody who's going to run a system is going to sell as much as he can or he isn't running a very good business.

Mr. BATEMAN. As I understand it, it's your view that there is a potential for commercialization of the Landsat system, but the time is not yet ripe for it to be done?

Mr. HENDERSON. The time is certainly not ripe yet because the marketplace hasn't been created and it's going to take people like Donn Walklet, who know about marketing these scenes and opening it up to value-added industry, in my opinion, to create the market that would make the current system profitable.

I would also further say most of us don't think that the Landsat D system, as we know it, is really a profitable instrument anyway, but that data can be provided by other systems.

Mr. BATEMAN. Do you foresee that the French SPOT system is going to be a success, and by that, I mean in a commercial sense?

Mr. HENDERSON. At the rate we're going, it may be the only thing flying. I think it'll be a great commercial success, but I shouldn't say that. Again, I don't know whether—I feel that the French system probably will pay for itself. I also strongly feel that it will be commercial in the sense the—it is a subsidized system and probably will continue to be a subsidized system one form or another. We hope that it certainly—we believe it'll be a technological success, or hope it will be.

Mr. BATEMAN. If you would inform me or refresh my recollection as may be appropriate, the French system, is that governmentally owned or is it a private operation with governmental subsidy?

Mr. HENDERSON. Well, I suppose it's how you define what "private" and "government" is in France. Their system is a bit different than ours. The SPOT Image is a commercially established organization, but it is certainly—I think it is 38 percent owned by government agencies, the parent company—I'm not sure of the exact number. It's a mixture.

Mr. BATEMAN. Do you sense that a part of the problem or the major problem for the nonemergence of a value-added industry and a more meaningful immediate commercial possibility lies in the lack of assurance of any continuity of data and upgrading of technology on our part? Is that the root of the problem as to why you are not totally sanquine about the immediate prospects of commercialization?

Mr. HENDERSON. I think you've hit the nail right on the head. Internationally and nationally. There is no—there is no assurance

anywhere around the world what the U.S. Government is going to do in this area, and that's why almost any decision would be a good decision.

We're either going to provide the systems and build the thing or we're going to get out and not do it and go somewhere else.

Mr. BATEMAN. I wonder if I could ask Mr. Walklet if he would react to that question. Is a part of the problem the lack of any assurance of continuity in operation and the enhancement of the technology?

Mr. WALKLET. I think I can second what Fred says. In my own statement, I said the business community can't tolerate the chaos here. There's no direction. The customers don't know what's going on.

Mr. BATEMAN. Are you telling us that if we would assure Landsat D' and a successor beyond that, that the private sector would then be sufficiently assured that the commercial market would then sort of generate itself?

Mr. WALKLET. I think what you say in terms of continuity providing a successor for Landsat D, Landsat 4 and continuity to the extent that when a suitable commercial vendor of data, domestic, comes along, you will step out of the picture, but until that time, you will provide data, and I think there is precedent for that in other areas, but providing that sort of policy, saying "We will supply the data and nothing else," would give tremendous—a tremendous boost to the commercial environment, and, I think, would allow the investment community to get behind this with a great deal of enthusiasm.

I think to replace Landsat with a commercial, totally commercial program, I think you—you need that sort of assurance of continuity and also, perhaps, as I suggested, a kicker in terms of maybe additional incentives for the private investment community to commit their funds.

Mr. BATEMAN. Thank you.

Mr. MCGRATH. Would the gentleman yield?

Mr. BATEMAN. I have con—I'll be happy to yield and have concluded my questions.

Mr. MCGRATH. Just on that point, you said one of those incentives should be an accelerated depreciation. What—how accelerated would you want it? Some of these things only have a lifetime of 3 to 5 years. How accelerated would you want the depreciation?

Mr. WALKLET. Well, I—I think, for instance, you should be able, in the case of a 3-year system, to be able to write off the whole thing in the first year. That would be one way to do it, but there are different components and there are different stages.

For instance, in the future, we may have platforms which have a lifetime of 10, 15 years.

Mr. MCGRATH. Well, if we interject that kind of—of a mechanism in this bill, then it goes to ways and means and then you'll never see it.

Mr. WALKLET. Well, I'm not an expert on the logistics of how these things are handled, and as I said, this gets into the whole issue of space commercialization in general. That area is—is equally uncertain in the private investment community. There are a number of concepts outside of remote sensing, materials processing,

various new transportation mechanisms which are sitting on the sidelines for want of a policy. Remote sensing is the same thing. If we had some sort of policy that said, "Whatever goes into space gets additional tax incentives," that would go a long way toward accelerating it.

Now, the French, the Germans and the Japanese don't have to wait for that because they have, as we have already seen, programs which are joint Government/privately developed and have a built-in subsidy. I think our subsidy—or the best kind of subsidy we can have in this country is equal tax incentives spread across the board for those who have the good ideas.

I think that's better than our system and I don't see why we don't use it.

Mr. LUJAN. If the gentleman would yield, don't you have that already with investment—in investments in research? You can write them off right—right away, don't you? Can—can the investor in a research project write off his investment right away?

Mr. WALKLET. In a designated R&D program. Let's say if we built one-of-a-kind, a new satellite, which had never before—that first article probably could be written off according to the IRS stipulations for an R&D limited partnership. If that system went operational, anything after that would apply according to any other investment—on any other investment criteria.

So what I'm saying is this whole field could evolve very quickly. The idea is to make this system very efficient. I think we'll be developing systems that are an order of magnitude lesser in cost than what Landsat cost. It's not going to—if it cost $500 million, then it's not commercial. If it cost $50 million, it will be commercial, and I think it can be done, but in doing so, there still need to be some sort of incentives which would—why should people go into this? Why shouldn't they go into doing any other larger number of investments which aren't affected by Government policy? That's basically what Wall Street tells me. This is a hot potato; we like it; it looks interesting, but at the moment, we don't want to get involved.

Mr. VOLKMER. The gentleman from Florida. Have any questions?

Mr. MACKAY. I'm not sure that I fully understand Mr. Walklet's testimony. As I understood what you were saying, it seemed to me that you were saying what Government should do is provide more incentives and basically stay out of how the free market is going to develop, commit itself to continuity of data, let the free market develop in the value-added area as rapidly as it can and worry later on about there being enough demand.

In other words, I think what you're saying is the demand for data, as it expands, that will be the quickest way to get to the question of who's willing to shoot a privately financed satellite into the air. Is that what you're saying, that we're going about it wrong by trying to think through and preimpose too many ideas on what the market is going to do in advance?

Mr. WALKLET. I think that's to a great extent true. What we're trying to do is define or the Government is trying to do is define a system before one understands what the market is. The—on one hand, I think the market will grow very rapidly when there's as-

surance of data and I think that market will justify the capital expenditure for space systems.

On the other hand, it's—it's very difficult at this time for the value-added community to get going when there is no continuity of data. Now, I—what I did say was that overseas suppliers of data will come along and supply that continuity and the value-added community will grow, but where the real danger here is for our own domestic acquisition potential is that right now we have the technology leadership in order to basically be the leaders in this industry worldwide, and that gets down to the sensor technology.

Other countries are going to build satellites, but we can build cheaper, more efficient, better data-gathering instruments right now and, in essence, lead and dominate that market if we want to. If we let this go toward the end of the decade before we provide any incentives for the private sector to get involved with the acquisition, those foreign countries will have the equivalent sensor technology that we will and we will not be able to compete in a private way with a private sensor system because we—we will be competing with subsidized Government programs and if we don't have the edge on technology, there's no way we can compete.

As long as we have the technology edge, we will be able to go out and provide a better product, even if their product is subsidized, we'll be able to provide a better product and be able to gain market share--dominate market share with that.

As soon as they have the technology edge, we might as well, you know, walk away because we won't be able to compete. If you look at the airline industry, where you have foreign airlines that are subsidized by their Governments, it's very difficult for our domestic airlines to compete. The product is basically a commodity. How do you differentiate that with—except for minor service conveniences and basically, it's very difficult to compete on that basis.

As soon as we lose the technology edge in remote sensing, I basically think we'll either have to—our Government will have to supply it exclusively, or we'll have to buy all our data from foreign sources.

Mr. MACKAY. I—I would like to ask Dr. Henderson to respond to that, but let me first ask this question. There was a memorandum sent out October 31, which had a set of—it's called "Overview of Guiding Principles." Did you see—did you happen—were you one of the persons to whom this was sent, either of you, so that you are aware of what our staff is driving at in an attempt to arrive at guiding principles in commercialization?

Some of your testimony seemed to me to be directed at these guiding principles and evaluating them and some did not.

Mr. HENDERSON. If you're asking me, no, I did not see that. I was responding basically to the letter of invitation.

Mr. MACKAY. OK. And Mr. Walklet.

Mr. WALKLET. I—I was responding to the invitation and having read the draft legislation, that's what I was responding to.

Mr. MACKAY. Good. Mr. Chairman, if I might, I'd like to ask both these witnesses to respond, if they would, in writing, to these guiding principles because it seems to me that's the point at which this committee should really be zeroing, not just this bill, but the question of what is going to be the principle by which the Ameri-

can Government decides commercialization? This is just the first of many problems, I think, that are going to come up like this.

If I might now, I'd like to go back and ask Dr. Henderson, did—are you saying that you think that it would be better to let the market develop a while or that it would be better to try to put principles in place by legislation now?

Mr. HENDERSON. I'd like to see your guiding principles first before I respond to that and I'd be glad to do that.

Mr. MACKAY. OK.

Mr. HENDERSON. I think there's some basic principles that need to be put in place. I—I don't have a problem with that. I just feel that we have this technology.

I want to respond to something that Donn said, if I may. I think that—I think the only way we're going to see this thing commercialize is to allow the market to develop with a Government commitment to continue in the value of the land observation systems. Maybe not precisely the way they're construed today, but with a commitment that we need this kind of information in the United States and we need to be a—a participant, the United States, around the world in this technology, and when we can commercialize it, I have no doubt that it will become commercialized, but we're stumbling around trying to figure out or maybe push it too soon in my opinion at the present time.

Mr. MACKAY. In other words, you could begin to get Government out of it by effectively charging more and more of your cost, your Government costs, to the people who are buying the information, the value-added people? Sooner or later, somebody's going to do that if you commercialize it, so the question of continuity of data at this point would be the Government should be trying to make the information available as broadly as possible and recover as much of its cost as possible.

Mr. HENDERSON. Well, I guess, speaking as an individual, I—I think what you're talking about is something that's been developed in the public good and exists in the public good. There is no way in the world that you're going to ever create a commercial system—certainly not right away, anyway—that handles—hands out Landsat data to school children and kindergarterners and everybody else and yet that's, in effect, what's being done today in a sense.

How do you commercialize that and get back your costs? How do you commercialize that and create a market for that multi-level user I was referring to? I think that'll happen, but it's only going to happen through a healthy value-added industry who can deal with various different levels and various different sophistication of users.

In our meeting last week in Houston, I was told by a number of the people there who have heavily committed moneys to in-house digital data processing of Landsat that they don't care about the value-added industry. Well, they're not thinking clearly on that in my opinion because they do care, really. It's just that their particular data they want to buy is raw data tapes and they do their own in-house value-added industry. It's a big one. And, of course, eventually they'll have to pay for that data.

I would like to just comment, if I might, on your question about—Donn was talking about losing the technology gap. That

concerns me a great deal and a lot of that is what politically goes on in the decisions made here in Congress and in the administration about what we do in the continuity of the program. That gets back to the continuity of R&D.

There are two examples in addition to the one I gave you about Stereosat that I think are worth keeping in mind. At the end of the last administration, the Japanese approached the U.S. Government and asked for a joint venture to fly by lease the synthetic apperature radar because that's the key thing they want to fly on their satellite. They were willing to, as a joint Japanese/United States venture.

This administration came in, in the interest of technology transfer, and said, "No." That made a commitment in the Japanese to build in-house their own radar, which in my own personal belief, will probably be better than the one they were talking about leasing from the United States.

The same thing recently happened to MBB, who is going to fly their own solid-state sensors, probably before the United States flies solid-state sensors on a commercial basis because they couldn't work a deal with the U.S. Government.

In my personal opinion, we should have perhaps thought about what we're doing there in forcing them to compete with us technologically. I couldn't agree with more what Donn says in that area.

Mr. WALKLET. Could I make one more point? When you talk about recovering costs, I have—I have to say that if you're talking about the system costs, the capital costs, I, as a value-added intermediary, am not going to put up with that because those costs are drastically overinflated, No. 1, by the fact that we're dealing with an R&D system in Landsat as it exists, and by the fact that it was created by a government of bureaucracy which doesn't have the priorities, the same priorities as a commercial supplier.

As I said before, Landsat D costs a half a billion dollars. It's an order of magnitude more expensive than a—what I feel a commercial system could be. If you want to have prices which reflect commercial criteria, fine, but don't ask me to pay the—the capital costs of an overinflated system.

Now, related to that, I honestly believe that in terms of continuity, what we're talking about here is only a few years. I think if we—we make the policy of continuity, that's all it will be because I think there's enough of a market out here, and it's available and the computer technology that we have at our disposal makes it available. That wasn't true 5 years ago. The computer technology that we have makes it available to the masses and so this market is going to grow very quickly in the next decade and when that market starts to manifest itself, there'll be all sorts of programs or ideas about acquiring the data, but if the act of continuity, a policy which says that we will be there to provide that data if nothing else evolves, which would be a real boost, you either——

Mr. MACKAY. What—what—what commitment of continuity would be required? A commitment that the Government is going to stay with it at least through Landsat 6?

Mr. WALKLET. I wouldn't even put a limit on it. I would say we will be there supplying data come what may and it's my feeling that before the end of the decade, there will be a commercial

system which will come in to take the place of whatever commitment that you have made. I think that's inevitable. Backwards integration of acquisition is going to occur, but you need to prime the pump. You can't stand here and get anything out of the well unless you prime it first, and if you're going to stand here and not make any commitment to the ongoing program, then nobody is going to invest in our system. They'll invest in other countries' systems, but not ours.

Mr. BATEMAN. Would the gentleman yield?

Mr. MACKAY. Yes.

Mr. BATEMAN. If the commitment is made that at public expense we are going to assure an indefinite continuity of data, isn't any private-sector reaction to that going to be in the context of how can we take that with little or no cost to us and then make a profit from it? Now, if the assurance is there that the Government will always be the source of the data, then why would private industry think in terms of going out and providing data itself at their expense?

Mr. WALKLET. Well, for the same reason you have any other vendor or services coming in to substitute for Government services. According to OMB A-76, any vendor can come in and substitute for a Government service if he can supply the same level of service at a equal or lower cost.

Now, if you—if you have a level of service which is based on reproducing the data, operating the data system, maintaining operating costs, and to some extent supporting the cost of the satellite, not amortizing it but supporting the operation of a satellite, I'm willing to bet in a very short order, somebody's going to come up with a private system that can compete and undercut that in terms of quality and cost.

Mr. BATEMAN. So your assumption is that while there would be a continuing commitment that the data would be made available by the government in all events, it also contemplates a forthcoming and positive attitude in terms of letting someone else do it if, based upon what develops through the continuity being assured, they can do it better and more economically.

Mr. WALKLET. Absolutely, and if—and I—as I—I'll say again, I think there should be incentives built right into whatever policy that's created to encourage the private sector to take it over. But let's not fight with each other. What I see here is a battle. We should be working together to commercial this whole system. To stand here and debate whether you're going to do it or not is basically creating a conflict within the private sector. So, you know—on continuity is part of it and I think incentives are encouragement for the private sector to take that function over is part of it, too.

I don't think there's any discrepancy or conflict there.

Mr. BATEMAN. I thank the gentleman for yielding.

Mr. VOLKMER. The gentleman from California have a few questions?

Mr. BROWN. I would appreciate being recognized at this time, Mr. Chairman.

Mr. VOLKMER. I'll recognize the gentleman from California.

Mr. BROWN. Gentlemen, first I would like to say that I think your testimony has been the most cogent and valuable of any that I've heard on this subject, and I appreciate it very much. I—I gather from what you have said that the—and you focused on the heart of this matter—that what we really need is an aggressive program, both to continue R&D to maintain our technological superiority and, secondly, to push the commercial development of the value-added in order that we can realistically determine the market as quickly as possible.

Am I—am I interpreting you correctly here? Is—yeah.

Mr. WALKLET. Go ahead.

Mr. BROWN. There's no obvious reason why we can't do that under the existing situation, is there? If we were to—if the President were to, say, make a strong policy statement that this is what we're going to do, have the best remote-sensing system in the world and then OMB would be willing to commit enough money for an adequate R&D program for the agencies involved and the present administrators of Landsat were to vigorously cooperate with the value-added industry to develop their activities, we could move along until we had established what the market was.

Let me ask you this: Is there anything in the bill—the draft bill—that would inhibit this kind of a process? As I understand the bill and the principles underlying it, while it may not be necessary, at least it doesn't adversely impact this process as far as I can tell. I'd appreciate your reaction to that.

Mr. WALKLET. Well, the only—the major conflict or discrepancy I see in the bill is awarding the—the operation of the Landsat system to one single vendor. Now, if—if you—if you want to provide—have—contract to have someone operate the current system and——

Mr. BROWN. Essentially that's all it is. Like we contract with Lockheed or whoever it is to operate the launch base down in Florida.

Mr. WALKLET. I—I was hoping that's what it was, but I have the feeling in reading it that there was—there was more; that this, in essence gave that vendor some edge in the marketplace in terms of the next generation system.

Mr. BROWN. Well, it wasn't intended to. There's strict language there trying to prevent that from happening.

Mr. WALKLET. The—the problem is that—I think is that if there is some feeling or connotation that this person is entrenched or has an edge, it's going to be very difficult for someone to raise capital to develop a competing system. It's hard for me to put my finger on exactly what it was about the language and I'll go back and read it again and see if I can define it more specifically.

Mr. BROWN. Well, I can see the possibility existing that it would be interpreted that this contractor operating the existing system might have an in on the next generation system which would be developed as a result of the continued R&D that the Government will be doing. That's provided in the bill, too. In effect, if the contractor does a good job, he might have the inside track to continue on indefinitely into the future operating or maybe eventually acquiring this system, but that wasn't the way it was intended.

Mr. WALKLET. That's—that was the impression I got, that was a—I think if—if somehow you can remove or counteract that impression, I would really like to have it appear to be a government system producing data up until the A tape or the raw data and if it's a Lockheed or TRW or whoever else who operates it, that's fine, but in terms of—of a system that's going to exist providing continuity, it's a government system, and whoever else wants to come along and substitute supplying data and the Government would then just be a customer; they'll no longer be a supplier; they will be a customer.

Mr. BROWN. Well, that—that's a very commonsense approach and I see no reason why we couldn't do it, but the problem is that this administration has a—a very strong desire to divest itself of any operations which conceivably could be operated by the private sector. In trying to do that, they are moving precipitously in some areas, like maybe the meteorological satellites, as an example.

And yet, if they—if the administration and the Congress in cooperation could develop a believable commitment to the path that you have outlined, I don't think there'd be any problem in continuing exactly the way we've been going, but somewhat more vigorously than we've been going.

The reason that your—your testimony intrigues me so much is that both of you represent the private sector and, in effect, you're calling for a larger or more continued or a stronger policy role for the Government in this field instead of rapid divestiture, which seems to be the picture that we're getting from the administration.

I hope you're getting that message into the administration, as well as to the Congress. Are you trying to do that?

Mr. WALKLET. Well, let—let me say I—the administration's goal of commercialization, I think, is a good goal. It's——

Mr. BROWN. Well, we—we—we have no argument with that.

Mr. WALKLET. Right.

Mr. BROWN. It's——

Mr. WALKLET. It's just the method and my feeling is that those objectives would be obtained almost as quickly, if not more quickly, by stabilizing the situation right now and providing the incentives for commercialization rather than throwing the whole thing out. What is needed now is some degree of stability. We have to have the data to build the market. We've got Landsat 4; we have to have Landsat 5. Having the assurance of continuity beyond that is necessary to give the investment community the assurance that, yes, indeed, we've got the life blood to keep this thing going in the long term.

My feeling is that within 4 to 5 years, there will be a substitute for that Landsat system if you put the right incentives in, and it will be a moot point at that point whether you build Landsat 7, 8, 9, or 10.

Mr. BROWN. Well, I—I agree with you and I particularly appreciate your analysis of the market, you're estimating a $12 billion market by the year 2000, and if that, in fact, occurs and all of these problems will take care of themselves because that will generate the private sector interest that will be necessary to carry this program on as you indicate.

I—I think you've made a unique contribution in analyzing this as a global information market rather than as an aerospace market. I'd like to see the studies on which you made that kind of projection, if you get to the point where you can release them. I think it would—my personal view is you may have underestimated that market, if anything, but time will demonstrate that fairly convincingly.

Mr. WALKLET. Well, I think it's important to think of it in those terms. If there's any doubt, I think all you have to do is look at what's happening in the computer field right now. You have a personal computer market that seven years ago didn't exist. It is now $7 billion and it's—that is just for the hardware and not the related software.

Mr. BROWN. Now the software market, I suspect, is much bigger than that.

Mr. WALKLET. Not yet, but it will be and there's an evolution here and this is important to realize, too. In any computer-based market, you have an evolution from hardware to software to data. Data will be in this system and the Landsat system will be less than the hardware and software investment initially, but in the long term, by the year 2000, it will be at least 50 percent of the market so you're looking at a $6 billion market by the year 2000 for data and that's because people, as they become more comfortable with the systems, start consuming the data in greater volumes. They know how to use the hardware; they know how to use the software; it becomes part of their business and like using the telephone, you don't think about picking up the telephone and making a long-distance call; you will use that data as a part of your business so data will not necessarily be—be as fast in its initial growth as the hardware and software size, but it will be substantial.

Mr. BROWN. Part of the problem here stems from the situation that one of you mentioned earlier, our reluctance to go public or to allow the utilization of certain hardware because of security considerations or other things. The radar is an example. The arbitrary determination with regard to resolution on the Landsat is another one.

If what you say is true, it—it would appear that events are rapidly going to overtake policy here, that the—our competitors around the world are going to make us look rather silly for rigidly, let's say, adhering to a 25-meter resolution when we have the technology to do much better than that or any number of other things having to do with sensors.

Am I—is my perception of this reasonable? Do you feel that the control over the technology policy exercised by the policy group in the Executive Office may be one of the factors inhibiting development here? Or would you care to comment on such a controversial subject?

Mr. WALKLET. Do you want anything, Fred, or should I put my foot in it?

Mr. HENDERSON. I don't think there's any question that there—that the military control of the development of remote-sensing exists and will probably continue in this country. I do think that reluctance so far to go into certain areas in the past will be availa-

ble to us from other sources in the near future. Ten meter data, for example, is the—from SPOT—is a very good example.

I would say, also, though, that the French grappled with that problem and I think we've seen, for example, in my opinion, a problem with the development of some kinds of data, for example, from the radar altimeter, Seasat, eventual follow-on to that program called Geosat, believe it or not, and—and the fact that that data may or may not be available to the private sector biologist because it has inherently good geophysical data which we could use for other purposes.

Hopefully, we can find a way of resolving and extracting some of that information with the cooperation of those people who control those sensitive areas.

Mr. BROWN. Well, do you think there's any chance that the—that the senior interagency group that made the decision that we would only go to a 25-meter resolution system might change its mind when a 10-meter system is commercially available from a competitor? Or do you think they're so stupid they still would continue?

Mr. HENDERSON. I hope that they will allow us to build 10-meter type systems if, in fact, we really want them. That's a lot of data. We're learning that high-resolution systems in digital format may be harder to handle. For example, most of the people I represent are already learning the difficulties of handling thematic mapper data is a lot more data-crunching than they had anticipated.

But in the long term, I hope that those things will open up and certainly we will—I think there will be pressure due that from developments outside the United States.

Mr. BROWN. Thank you.

Mr. VOLKMER. The gentleman from Washington, Mr. Chandler.

Mr. CHANDLER. Well, I think my colleagues, Mr. Brown and MacKay and others, have gotten right to the bottom line of this situation and obviously we have a whole range of options open to us, to stay with the current system and Mr. Walklet, I guess what intrigues me about your testimony is when you talk about the potential market that we've only tapped 1 percent of it already and then at the same time, I think I heard you say that it really wouldn't be possible for a total commercialization of the—of the system even with that market available. I guess my question would be, why on earth wouldn't there be? Why wouldn't, with that potential there, risk-takers be willing to jump in right away, under the right conditions?

Mr. WALKLET. Well, there's—there's two answers that are tied together. No. 1, I alluded to the—to the uncertainty of the policy that exists within the Government. Investors are very much frightened by any sort of political hot potato like this. They see the potential. They are very reluctant to put their funds into it. That's not to say it isn't happening. As a matter of fact, this very day some money is going in to a competing program to Landsat, a significant amount, so it is happening and those people are the leading edge of investors.

On the other hand, as I initially said, the Government has not done a good job of positioning this technology as a commercial technology. There are not very many people on Wall Street who even

know what remote sensing and Landsat is and those who do see it as a Government technology. So there's a problem of perception.

Now, when this perception changes, money will come into this, and I think from my point of view, I can document the market through my own research. There's no problem there. I know the market's there. I know the technology's there. The policy is the problem right now and so as soon as that changes, I don't think we'll see any hesitation for investors to come in. And as I say, it's already happening.

Mr. CHANDLER. Well, I agree that the policy is—is the problem, but in your testimony, and the thing that I was so encouraged to see was that you're saying that the consumer should be concerned about any suggestion of Government-subsidized transition and as I read the bill and studied it, it seemed to me that perhaps that might be the weakness of this legislation because—and I compliment the drafters for being right up front about it; they come right out and say, "This is a subsidized—Government-subsidized transition," and the problem I have, and Mr. Henderson—or Dr. Henderson's answer to the question when he was asked whether he pays for the remote-sensing data that he gets, he said, "We pay taxes." Well, hell, I pay taxes, too, and I don't use that stuff, other than look at National Geographic and a few other things, so you're the beneficiary of this subsidy as well.

And what you've got here, it seems to me, is a system with the Government being, if I understand it correctly, the largest customer at the present and you all are other customers and yet with this tremendous market that could be developed out there, and I wonder if we shouldn't take the blinders off and look to a new horizon where the whole thing is totally decommercialized—I mean commercialized, and we get the Government completely out of it, where you pay for what you get and the Government pays for what it gets and it's all done on a competitive basis.

I haven't heard a proposal yet that gets us there——

Mr. WALKLET. Well, let——

Mr. CHANDLER. Maybe I'm just blue-skying, I don't know.

Mr. WALKLET. Well, let—let me say, and I addressed this before, we're—we're all for that, that's what Fred and I are for, a totally commercial system, but let's—let me say again, also, that will be the generically, the $50 million system and not the $500 million system. I'm not—you know, true, Landsat, this whole technology would not exist if it wasn't for the Government's upfront investment, but now that it has commercial potential, why do we continue to live with those costs? If—if indefinitely, you know, if there's an indefinite commitment to a Government program not to be commercialized, we will have those costs because it's the very nature of Government programs, shuttle, otherwise, that there are a lot more expenses than they need to be.

Nevertheless, we need the continuity of data right now. You can't turn off the spigot; you can't drop this bomb out in the private sector overnight; there needs to be a transition; there needs to be assurance of continuity and I'm sure the private sector will come in with an efficient system in a very short time and Fred and all his oil companies will pay their own share at that point because

the company will have to make a profit, but we have to look at this transition process. That's the issue at hand.

Mr. HENDERSON. Mr. Chandler, if I might, I would just like to comment on taxes. That comment really came from the fact that up till now we didn't have a choice and when the Geosat was committed—committee was formed in 1976 as a bunch of naive geologists who were still learning what Washington's all about—I'm just a country boy from California—and——

[Laughter.]

Mr. HENDERSON. That's true.

Mr. CHANDLER. Dumb like a fox.

Mr. HENDERSON. Just the same, I was literally instructed by the original group that formed the Geosat Committee, go back and tell them what to do with windfall profit taxes and so and so forth in the area of NASA's research and development because that's the only place it was being done, and I would like to reiterate what I said before, I still think that kind of R&D money should be provided and I think we taxpayers should pay for it because you and I both benefit one way or another from what's done there.

But I agree with Donn, if we can get the continuity and the commitment of the U.S. Government with the private sector to build and maintain these systems, the private sector will take it over in due time. The due time in the process that leads us to get there can't happen unless we have commitment to continuity. I just don't believe it can happen any other way. If we're stumbling around without anyone knowing what's going on, nobody's really going to invest in this thing, at least not the way we think it should be invested.

Mr. WALKLET. Just one more point on the R&D, I think a good analogy is what NASA does for the aircraft industry right now, ongoing R&D in aeronautics. There's not a great deal of controversy over that subject. It has made us a leader in that technology all over the world. It has been a great benefit in terms of overseas sales and balance of payments and all those good things. It has paid for itself over and over and over again.

That's the same thing we're talking about here in remote sensing. The sensor technology needs to be continued. The leading edge needs to be continued by NASA, which is its job, it's an R&D agency, it's not an operational agency. NASA should be doing R&D; it should be keeping us at the forefront of technology so we can make these operational systems competitive on a worldwide basis. It pays for itself in the long term.

Now, if you're going to take a 2- or 3-year horizon, then maybe it's not going to pay for itself. If you take a 10-, 15-, 20-year horizon, it will and many times over.

Mr. CHANDLER. Thank you, Mr. Chairman.

Mr. VOLKMER. The gentleman from Florida, Mr. Lewis.

Mr. LEWIS. Thank you, Mr. Chairman. I have a couple of questions on—to Dr. Walklet. You mentioned that your overall data analysis—well, not data analysis, but your consulting services and data would exceed $12 billion by the year 2000. What kind of—how did you come up with that type of estimate?

Mr. WALKLET. Well, let me explain how the Government has done it or not done it. Let me put it in those terms.

Mr. LEWIS. Both ways are correct.

Mr. WALKLET. Basically—the studies that NASA has paid for and the Government has paid for as a whole have looked at what sales are done now and sort of gone out and extrapolated that and said if it's $6 million now, it'll grow at 10, 20 percent.

Now, what one has to understand is that the current customer base is a very sophisticated one. They're users like Geosat's oil companies who can take the raw data and don't want value-added services. They can manipulate it themselves. That's also true of the many Government agencies that use it—use it—use this data: Department of Agriculture, Interior. They are very sophisticated users. The university community.

To great extent, when this market develops, it will be marketed by the value-added community who can take the very complex digital data and convert it into an information product, not data, information. That's how the rest of that market will be achieved.

Now, how we've arrived at that—that estimate is the fact that we've looked and gone to the other side of the spectrum and said, "OK, what is—well, how do natural resources affect our economy? What proportion of the GNP is natural resource intensive?"

We've done that by market segment or group, agriculture, forestry, land-use planning, oil and minerals, and we've looked at what component of the decisionmaking process that those industries use are information intensive. In other words, they have to have some information to make a decision.

So you find—it's a—various processes of analysis. You find out that if—well, let's say about roughly 30 percent of revenues are information intensive and out of that, you extract what proportion of that 30 percent would be affected or could potentially be affected by having timely information from a satellite source tied in with other sources.

Now, we back it out that way. Now, that's—that's assuming, making some assumptions. First of all, that we're going to have the appropriate computer technology to address the processing and distribution of that data. As someone who lives and works and is intimately tied in with the Silicon Valley in California, I will assure you that that technology will be available for us when we need it to make the access, the processing, the distribution of that data in a form that people can use readily available.

That—10 years ago, that was not true. The Landsat 1, 2, and 3 era, we did not have that computer technology, but we're rapidly evolving to the situation where a super computer will be on your desk within 10 years and the ability to extract information with that device will be very easy.

Now, a very complex data base like remote sensing will be many times more accessible and usable at that point, so based on the availability of the appropriate technology and the fact that so much of our business is information—resource information intensive, that's how we got those estimates.

Mr. LEWIS. It appears that you like the subsidy and you brought out in your testimony that the political problem—how do you feel that would be best for the Government to enter into any kind of a partnership with the contractor? Should they make the guarantee

a loan guarantee or should they make it more attractive as payment up front as a subsidy?

Mr. WALKLET. I don't—well, there are all sorts of subsidies. Tax incentives are subsidies of a sort. My feeling is that if you enter into a contract or go into a competitive process where the winner gets a guaranteed market, what you're doing is designating that entity as the one that has predominant influence. He has the competitive advantage once he steps into that position. He has a guaranteed market. It's very difficult for anybody else to knock him out.

On the other hand, if you provide tax incentives to all comers, all groups who have ideas how this could be commercialized, if you give them equal opportunity on the basis of equal tax incentives to provide a service to the Government, then everybody has a fair crack at it. And this gets back to the issue of—of how this contract is awarded. If you're guaranteeing somebody—let's say the proposed Comsat initiative that was up several months ago to a guaranteed market—if that is the way the contract would go, I think that we deter any other companies coming in and investing in a competing system. That's my personal opinion.

Mr. LEWIS. OK. One final question. How do you feel—in your testimony, you bring out the question of Wall Street, again the political implications. You're for full commercialization.

How do you feel that you can have investors invest in this system without feeling they're buying a pig in a poke, particularly if the Government is part of the partnership?

Mr. WALKLET. Well, I—I'm not sure I like the term partnership. The transition we were talking about before was one in which the Government assured——

Mr. LEWIS. Let's take the Government out of it, then, and just have you come up with the financial responsibility to provide the Landsat system.

Mr. WALKLET. OK.

Mr. LEWIS. And you have the problem with Wall Street and we do have—the Government's still going to be involved to an extent with the heavy R&D. How do you feel that you can sell this to investors?

Mr. WALKLET. Well, the heavy R&D is a plus. I mean, that's—that's saying:

> Look, a lot of our R&D problems are taken care of here and we're the leader in the technology in the world now. We've got 20 years of R&D to take advantage of. We've got more R&D coming from NASA in the future with that policy in place.

All we're doing in commercializing this now, setting up a company, is taking advantage of all that experience and adding the element of marketing and that—if you can document the fact that the market is there and you've got the competence to do it and you've got the skills and the people, then that's the sort of thing that investors are used to dealing with.

On the other hand, if we have just the active debate, the up and down cycles that Fred documented, I think that—that causes such uncertainty. The investors are unsure whether tomorrow you may shut this whole thing down, whether the State Department would say, "You can't export data;" whether the Department of Defense

says, "You can't put a satellite up there." That kind of uncertainty drives investors wild.

Now, if you can't resolve that, you're not going to help me at all. If you can resolve that, I don't think there'll be any problem at all finding investors.

Mr. LEWIS. Thank you.

Thank you, Mr. Chairman.

Mr. VOLKMER. The gentleman from Florida, Mr. MacKay?

Mr. MACKAY. Mr. Chairman, I recall the initial discussions with Secretary Baldrige and others as to why they had gone this route, and it seemed to me that they were predicating the whole idea of commercialization on the thesis that we need to have a private-sector, profit-oriented company operating the satellite because they will get out and aggressively market the product, and what I hear Dr. Walklet saying and Dr. Henderson saying is: "The product is going to be expanded, not as a function of some private-sector marketing, but as a function of Government getting its act together and having a stable policy that one could rely upon."

Now, I would—in other words, the selling of this to a single individual might actually induce an effect that's opposite of what we're trying to do.

Dr. Henderson.

Mr. HENDERSON. I—Mr. Walklet is the marketing expert, but I think what you just said is absolutely correct. We're concerned about—that gets back to the importance of the value-added industry which will do the marketing for you. We are concerned—or I, as a user, am concerned that if you lock it up in one company, we may never see the products we'd like to see developed or the ones that are important to us may not be commercial and never be developed, and yet, you know, it's the chicken-and-egg type thing. If you lock it up, in a sense as it is locked up in the Government right now, we have little to say about what comes out of the system. And so we have to work with what we have.

Landsat was not designed for geologists, and yet we have found probably as much use as anybody has in it, but we need other things, and if you lock it up in a private group, rather than allow a value-added industry to find out through marketing, which Donn knows much better than I do, in a free enterprise system, that's where you'll get your best answers in my opinion.

Mr. MACKAY. And the fact of the matter is we may have a non-problem because we've now got competitors trying to get more data available. They happen to be competitors in other countries, but we have competitors struggling to make data available to the value-added industry.

Mr. WALKLET. You've got a problem in the sense that they're not domestic, though. You want a domestic industry to develop in the acquisition end. You don't want to have in the year 2000 $6 billion going overseas to foreign suppliers of data.

Now, part of what my statement says is that I believe that the large companies that exist now who might have a lead in competing for this contract are not the ones who are going to give Dr. Henderson and his group the innovative products that they want in the future. I think in private he will tell you that. I think he's

had some experience in dealing with some large companies who don't understand how he does business or his people do business.

On the other hand, what I did say was that the fact that there are—that there will develop some value-added players who will integrate backwards into acquisition and they will do it and provide the kind of data products that these people want and the agriculture community and what-not because they understand the problem. They understand the marketplace and they go backwards in developing a sensory system based on understanding that problem.

Landsat was—in one of my own analogies—was developed as an R&D program, fine, but it was never developed optimally for commercial purposes. It was developed as a "Gee Whiz" box and then after they got it up in the sky, they said, "Well, what can we do with it?"

Well, that's fine for R&D, but when you develop a commercial system, it needs to be developed from the user on up instead of from the satellite on down. So I really believe we should leave the door open to those companies who you may not even know today or who may not even exist to provide the kind of data services, the acquisition services, that we cannot get right now.

I'm a geologist. I know Landsat's been good. The thematic mapper's even better, but I'm also a technologist who knows that within 5 years, we can surpass the thematic mapper by an order of magnitude in sophistication and you'd better give that community a chance to do that, otherwise someone from overseas will.

Mr. MACKAY. Well, then, I would just like to pose this question. The underlying problem, then, is that NASA is set up to do R&D, but it's not set up to set any priorities in terms of rapid commercialization. Maybe what we need is a dimension in NASA that would identify these high potential areas where a technological lead would—could be translated into a huge market.

We just finished oversight hearings with NASA and one of the questions is, where are you headed, and I can't say that they were able to answer that.

Mr. WALKLET. You've got a problem—and I'm going to be perfectly frank—I—I have no ongoing relationship with NASA to protect, but I—NASA is a wonderful agency, but they have a tendency to grab onto technologies and not let go. You build a constituency within an agency whose existence depends on an ongoing program and they might not be willing to give it up.

They don't necessarily understand the worth of what they've done already. The shuttle may be another example of that sort of thing going on right now.

Mr. MACKAY. So what you're saying is that maybe, in trying to develop a commercialization policy, we ought to take a look at NASA and the decisionmaking process there and try to make sure there's someone in there who is thinking about commercialization at that point so that you don't just continue the "Gee Whiz," but you start trying to look for the immediate spinoffs.

Mr. WALKLET. NASA needs a policy organization that's rewarded on the basis of how successful they get a project out of the agency and into the private sector. There is no incentive system in NASA to reward people for getting programs out of NASA.

Mr. MACKAY. In fact, the incentives, if they are humans, are just the opposite.

Mr. WALKLET. Exactly.

Mr. HENDERSON. Mr. MacKay, may I make a comment? I just wanted to state that in the deliberations of the Halbouty Committee, one of the strong recommendations that we made toward a commercial entity was to create a overseeing board, whatever the name would be, I don't know what the name should be, consisting of businessmen, primarily, and other people, not necessarily associated with the user community or the Government, who could help that transfer between any commercial entity and Government in terms of an overview committee or board to help direct where these things should go and the needs that would apply.

Mr. MACKAY. We had an interesting dialog in which the committee was asking that very question. Don't you need a statutory advisory committee of some type, the future of which is not dependent on doing business with NASA? In other words, someone other than researchers trying to help with policy formulation to whom the Congress could look directly and ask questions directly and feel they were getting an independent answer, and the answer we got was, "Absolutely not, that would make things worse instead of better."

Mr. HENDERSON. Well, I hadn't thought until you just asked that question, but in that recommendation which we strongly urge, overseeing a commercial entity, if the R&D is to continue to be done in NASA where we think it should be, or I personally think it should be, then obviously they should have some interface with where—interfacing between R&D and future commercial programs. That ought to be included somehow.

Mr. MACKAY. Mr. Chairman, I'd like to, if we might, when we send out that policy memo and ask for their comments, I'd like to ask specifically for your comments on that question of how we could better develop a dimension that is sensitive to commercialization within NASA.

Mr. VOLKMER. I have several questions. Time's getting on. I appreciate your comments.

Dr. Henderson, in your statement on continuity of data and the legislation would provide for a baseline the MSS [multispectral scanner] as being the baseline and you mentioned, I believe, that you'd prefer to have the TM thematic mapper. Now, isn't it true, though, you can still have the thematic mapper and get the—as pointed out, really, in your testimony—you can still get the MSS data from on board, is that correct?

Mr. HENDERSON. You can get an equivalent of the MSS data from the four bands and you can transmit it down to the S-band to those people around the world who want MSS data only, and there'd be slight differences, but I don't see that that would be significant differences or even alter a long-term MSS type data baseline for environmental and other kinds of studies.

But having the two systems is redundant and then for our community, which is not the total user community—I mean, there are people who don't care about the shortwave infrared bands yet—I guarantee they will in the future. Just the same, we believe the better—the more sophisticated system is, in spite of its extra cost,

is far more important than the MSS system, and since you can get both out of the TM, why build both or fly both.

Mr. VOLKMER. All right. If we provide, though, that we need—we want to get continuity on that MSS data, that doesn't preclude the use of a TM to provide the data?

Mr. HENDERSON. No, sir, and I think you had a line in your testimony—you said MSS equivalent, and I think that's——

Mr. VOLKMER. Right.

Mr. HENDERSON [continuing]. Most acceptable.

Mr. VOLKMER. All right. Now, on that, I just—since I'm not familiar with the specifics on the data, hardware, software utilizing MSS, is TM data compatible with that?

Mr. HENDERSON. TM for hardware and software is a more expensive system, which was, by the way, as I understand it, one of the reasons that the Congress got enough pressure internationally to put the MSS back on Landsat 4 and 5.

Mr. VOLKMER. Well, that's my point, though. It's not compatible, is it? In other words, I have to have separate hardware and software to utilize TM.

Mr. HENDERSON. You have to have additional hardware over a basic MSS system to handle TM data, that's correct.

Mr. VOLKMER. All right. Now, with SPOT coming on and with stereo and with, say, 10 meter, aren't you also going to need new additional software/hardware?

Mr. HENDERSON. Yes, sir, but anybody today who's gearing up to take care of either SPOT or TM takes care of both and all stations, for example, being built today, albeit being held back because of indecision in the United States over what's happening with the Landsat program, just the same, are building dual systems and the cost between building—providing for SPOT and for TM is not very significant, but both are greater than the basic MSS systems—MSS systems on the ground in existence today.

But again, anybody who is in remote sensing, I think, realistically looking down the road, certainly in the organizations I represent, are all gearing up to take more expensive systems. I mean, the more data-intensive systems.

Mr. VOLKMER. What is the writeoff period on that type of hardware and software? Would you say—how long a period of time are you looking to utilize that?

Mr. WALKLET. I think it's 5 years.

Mr. VOLKMER. Five years is all?

Mr. WALKLET. Well, I think it's——

Mr. VOLKMER. In other words, they're going to have to renew it or get additional because of changes coming or what?

Mr. WALKLET. Well, for tax purposes—are you talking about tax——

Mr. VOLKMER. I'm not talking about tax purposes. I'm talking about actual utilization.

Mr. WALKLET. Well, I—I think in—you have to look at the evolution of computer products in this whole scheme of things, and I think——

Mr. VOLKMER. That's what I'm trying to look at.

Mr. WALKLET. Right. And I think a 3-year horizon is typical, that within 3 years of buying that piece of equipment, that piece of soft-

ware is going to be obsolete. Now, in terms of replacing it, that becomes an economic decision of whether you're going to get more utility out of the next generation piece of machine and/or data that you're talking about.

Now, some people own computers and have the software for doing MSS, but they can't do TM. They're balking about having to buy TM because they're—they'll have to buy additional computer hardware. That's something they're going to have to do anyway soon and probably the cost of buying that extra equipment is going to be a lot less today than it would have been 3 years ago.

In other words, the computer power you can buy now is probably two or three times greater for the same number of dollars. Everybody faces this who uses computers and if you don't make a new satellite system or a new sensor system because your customers cannot use it, well, what you can do is add on something. You can an extra processor, an array processor or something, but for the most part, over a 5- to 10-year period, those people will have to buy new computer equipment.

Mr. WALKLET. What part of the total investment is that computer equipment, as against saying purchasing the raw data to put into that equipment?

Mr. WALKLET. It's a high proportion in the early years.

Mr. HENDERSON. The average cost of gearing up to handle Landsat data, digital processing for most of the companies that I represent is in the range of $1 million to $2 million, just to get started and those companies operate today on an average operating budget in the bad year, 1983, of roughly $1 million to $1½ million.

Mr. WALKLET. Can I say one more thing now?

Mr. VOLKMER. All right.

Mr. WALKLET. I—I think that what you're seeing now—and this is a revolution going on in that the processing power that existed 3 years ago, the half a million dollars, will be bought for less than $50,000 in the next year or two in terms of image-processing capability. So that is going to be part of what will——

Mr. VOLKMER. Spur the market, that's your——

Mr. WALKLET. Yes.

Mr. VOLKMER. All right. Then I'd like to address this question to you. Mr. Walklet, you pointed out that, you know, we've got to get from $500 million to $50 million as far as making satellites commercially viable. Is that correct?

Mr. WALKLET. That's correct.

Mr. VOLKMER. How do you build a satellite that, say, that will give a 10-meter image with a thematic mapper or stereo for $50 million?

Mr. WALKLET. Well, let me say I'm not sure that we want 10-meter data. Dr. Henderson alluded to that a few minutes ago. You know, the intelligence community—I—I came out of the military and understand why they want high-resolution data——

Mr. VOLKMER. And there's a lot of people that do not want.

Mr. WALKLET. There's a lot of people who don't want it because of the data-handling problem.

Mr. VOLKMER. Right.

Mr. WALKLET. Military applications are site-specific. They look—they may range over a wide area but when they're—when they

want to home in on a particular area, it's very site-specific. For resource applications, you're looking over a wide area so you—going to 10-meter resolution is something that I'm not sure is necessarily a high priority in the beginning.

Now, the 30-meter thematic mapper data looks—25 to 30-meter, in that area, looks very interesting and I think that may be optimal, at least for the time being, but I think it's conceivable to build a thematic mapper substitute, and I say substitute, for less than $20 million if you know what you're doing, and I—I'm not going to say exactly what that—what the implications of that are.

If you want to go through the Government process of procurement, you're going to pay a hell of a lot more for it and that—if you don't, you're going to probably save a lot of money. So I think that's—and of course, that technology is going to revolutions, too. You know, thematic mapper, MSS, are 10-, 15-year-old systems. That same technology is being revolutionized at the same pace that computers are being upgraded too, so the costs there are going way down.

Mr. VOLKMER. Now, do I understand you all correct in saying that the 3 years we basically are going to get out of Landsat D'—let's say 3 to 4 years at the maximum—it could be 1 year, who knows—but let's assume 3 to 4 years, is that sufficient time in which to get a commercial process going, have commercial satellites operating, Government out of it?

Mr. HENDERSON. My opinion, the answer to that question is probably no, but I am coming from the point of view that as I stated before, our community wants to get a minimum of one good global data set. If all ground-receiving stations around the world were convinced the United States was going to fly TM for 3 or 4 years, or the system would work that long, and upgrade, then through ground-receiving stations in addition to the collection in the United States, we might be able to get that data set in one satellite, but I—I personally don't think that's a safe bet. That's one of the reasons I support at least the two-satellite program, which the original—was originally accepted by the Reagan administration in Landsat 4 and 5. That's why we want Landsat 6.

If the private can come up and put up the TM-type data in that same time frame, then we're all for it.

Mr. VOLKMER. Mr. Walklet, do you have any comment?

Mr. WALKLET. Well, I think it's conceivably possible. I think it's altogether possible that an initiative could go in the very near term which would provide a substitute for TM——

Mr. VOLKMER. But you're saying that we need accelerated depreciation, higher investment credit than a 10 percent, 15- or 20-percent investment credit?

Mr. WALKLET. That would be nice.

Mr. VOLKMER. Lease-back provision.

Mr. WALKLET. The idea is that if you want to get the investment community off the dime, right now, that's going to get their attention. It's going to happen sooner or later. I think if you—if you have a period where this applies, you can limit the impact on the Treasury, but what we need to do is get the investment community, not only in remote sensing, but in space technology in general, off the dime. We need to get their attention. We need to get money

into this area quickly because we are dealing with foreign subsidized programs that are coming in aggressively in all areas. Remote-sensing materials, processing platforms, launch vehicles.

And unless we get off the dime very quickly, we're going to be competing head-to-head on—with equal technology with subsidized systems and we can't afford to let that happen.

Mr. VOLKMER. But if you have new investment companies coming on, which you envision, is that correct, instead of the old-line, big companies, large corporations?

Mr. WALKLET. I see an evolution into new companies in remote sensing.

Mr. VOLKMER. If you have new companies in remote sensing, how do they utilize in their first years any type of investment credit or accelerated depreciation? Maybe I'm wrong, but the way I see it, if I'm going out here and five or six of us start up—we get the investment money and we build this spacecraft, along with this satellite, it's going to take them about 4 years to do it, 3 to 4 years. Is that correct? Do you agree on that?

Mr. WALKLET. Possibly, possibly.

Mr. VOLKMER. Every year is a loss year, tax purposes? Correct?

Mr. WALKLET. Right.

Mr. VOLKMER. Can't—nothing coming in. I——

Mr. WALKLET. Well——

Mr. VOLKMER. The fourth year, let's say I shoot it up. Right?

Mr. WALKLET. Right.

Mr. VOLKMER. OK. Now, I've still got a loss year.

Mr. WALKLET. Well, let me—let me——

Mr. VOLKMER. Whether I've got 1 year or whether I can take it out in 3 years or 4 years, I'm still going to have a loss year. I'm going to have all those losses from prior years to carry forward. I've got my first year, whether it's accelerated depreciation plus the investment credit. I can sell off some of that investment credit.

Mr. WALKLET. Can I—can I answer that quickly?

Mr. VOLKMER. Yes.

Mr. WALKLET. I think—first of all, you're—you won't necessarily be sitting there twiddling your thumbs while you're building that satellite. You'll be developing the market yourself or doing something to earn revenue.

On the other hand, there are financial devices which can optimize on that if you're a new company and can't take advantage of the losses. That's—the nature of the financial community is such that they can provide services which allow you to optimize on that sort of thing.

That's the nature of my business——

Mr. VOLKMER. OK.

Mr. WALKLET [continuing]. Is finding ways for new companies to take advantage of these tax incentives and it's done every day and there's no reason we can't apply the same techniques to this field, too. What I'm saying is the additional tax incentives will help to get those entities that deal in these financial services a lot more keyed into this right now because they don't understand space technology. I mean, they've never had to before.

Mr. VOLKMER. I have no further questions. Anyone else?

I want to thank both of you very much for your time and information. We will provide you with our guidelines or principles to draft the bill and we'll hold the record open for 2 weeks and request in that time you reply to those as the gentleman from Florida has requested.

Mr. HENDERSON. Mr. Volkmer.

Mr. VOLKMER. Yes.

Mr. HENDERSON. Thank you very much for allowing us to attend. I want to extend from Geosat Committee the offer to any of your members of your committee who would like to visit and tour the [illegible] of some of our Geosat companies to see actually what we do [illegible] Landsat data, how it is integrated into the exploration process. I think it might be worth your time.

Mr. VOLKMER. Do you have any in California?

Mr. HENDERSON. Yes, sir.

Mr. WALKLET. Yes.

Mr. HENDERSON. We can arrange it.

Mr. VOLKMER. San Francisco, Los Angeles, San Diego?

Mr. HENDERSON. Los Angeles.

Mr. VOLKMER. Los Angeles.

Mr. WALKLET. Or in San Francisco, too.

Mr. HENDERSON. Yes.

Mr. VOLKMER. Well, I'd request staff to look into that possibility.

Mr. HENDERSON. We'd be glad to arrange a—or anybody in the area of Texas, Oklahoma——

Mr. VOLKMER. Well, some of us may—some of us may be in that area later on in the year——

Mr. HENDERSON. All right.

Mr. VOLKMER [continuing]. Is the reason I'm saying look into other things so——

Mr. HENDERSON. We'd be glad to arrange a trip.

Mr. VOLKMER. If we could fit it in, we might be able to try and fit it in.

OK?

Mr. HENDERSON. Thank you.

Mr. WALKLET. Thank you.

Mr. VOLKMER. Thank you very much.

Our final witness today will be Mr. Raymond Kammer, Chairman of the Source Evaluation Board, Department of Commerce. Sorry you had to spend so much time. Looks like we're going to go in the lunch hour, and your statement will be made a part of the record in full and you may either review your statement in full or summarize, however you so desire, and good to see you again, Mr. Kammer.

STATEMENT OF RAYMOND G. KAMMER, CHAIRMAN, SOURCE EVALUATION BOARD, DEPARTMENT OF COMMERCE

Mr. KAMMER. Good to see you, sir, thank you for inviting me.

Sir, at your pleasure, I can go through my statement or we can just go to questions if you wish.

Mr. VOLKMER. However you so desire. It doesn't——

Mr. KAMMER. Well, why don't I go through the statement as quickly as I can manage.

Mr. VOLKMER. OK.

Mr. KAMMER. What I'll do if I may is simply address myself to the five issues that you posed to the Secretary.

The draft legislation that you've currently got under consideration addresses a number of very important issues. I think they're the right issues. I think it's a good list of issues and touches all the bases that I think are important. Many of these same issues we've also included in the RFP.

We've included them in such a way as to try and elicit from anyone who chooses to comment on the RFP what their opinion is of the right way to resolve these issues. I think this is an important step to take and I think until it's done, that my advice would be that it's premature to move on legislation such as you're considering right now.

The first issue that you posed to the Secretary of Commerce was the extent of Government oversight and regulation that would be required during private operation of land remote-sensing systems. It's our view that, with one exception, there's no regulatory scheme or authority necessary to enforce the stipulations at least that we've set in the RFP, many of which are similar to the ones that are in the draft bill.

We've currently got antitrust regulations, international trade controls, national defense reviews, communications frequency allocations, and launch approvals. They already have structures that should work fine.

The one exception to this conclusion is that the Government may need additional authority to impose civil penalties if a successful bidder fails to meet any of the national security or international commitment requirements outlined in the RFP. The point of this is that one can imagine performance by a contractor that didn't justify or make it desirable for the Government to step in and take the system over or tell the contractor to hit the road, but you might want to make sure that he never did it again, and you might want to impose some sort of financial penalty, for instance.

The second issue touches on the impact of the proposed provisions in the draft legislation on U.S. international relations and national security. In the case of national security, the provisions in the draft legislation are essentially the same as in the draft RFP. We agree with them.

In title II of the draft legislation dealing with international relations, the requirement, as I understand it, is for continued service of foreign ground stations for the life of the contract, for the life of current contracts with the stations and the way those contracts read, that means either 3 years or when NOAA ceases to be the manager. That seems pretty reasonable to me and consistent with our own—our own thinking on this.

I have a somewhat different statement in the—in the testimony which was written rather hurriedly, and that statement's wrong in my view.

Issue 3 has to do with the plan for transition between Government operation and full private operation, as well as the effect such a transition might have on data continuity. The major difference between the draft legislation and what we had had in mind in

the draft RFP is section 201(d), which would prohibit the transfer to any contractor of title to the Landsat system or any part of it.

We think this is probably overly restrictive, although I'd have to say that I think it's unlikely that a bidder is going to ask to take over ownership of the current Government system and the consequent responsibilities for assuring that the system operates. However, if a bidder did propose to take over the system, that would be probably be a good deal for the Government and we think it's a reasonable thing to leave that open, see if any bidder would be willing to do it.

Issue 4 asks about the reasonableness of criteria that are proposed for the evaluation of industry bids. The criteria that are in the draft document are essentially the same as the ones that we've also been working with in the RFP, so I find them pretty attractive.

The one exception to that is the draft legislation also mentions the criterion about conflicts of interest that might obstruct access to the data. We believe that conflict of interest in data access are adequately covered by antitrust regulations and, therefore, it shouldn't be an evaluation factor. They're either consistent with antitrust and there's no problem or they're inconsistent and they've got big problems.

Issue 5 focuses on the wisdom of maintaining an "open skies" policy and the extent to which such a policy might affect adversely the commercial opportunity. One of the purposes of the RFP, and the reason for the approach that we took was to try and provide enough information to answer this question. At this time, there really isn't any business plan data that allows me at least to arrive at a conclusion as to whether or not nondiscriminatory access would deprive a commercial operator of a significant income stream.

In our RFP, what we did was recount the current Government practice with respect to nondiscriminatory access and make a very strong suggestion that the Government would be most happy if this policy was maintained, but we also went on to ask the bidder what changes they thought were needed to make it a better commercial opportunity and this is a major difference between the RFP and the draft bill.

We say that if a change is needed in this policy, we'll talk about it, but you'd require Government approval before such a change could ever be instituted and the bill goes, at this point, to the point of saying there shall be nondiscriminatory access to data, period.

The sixth issue that was raised was basically any other matters that we thought ought to be addressed in draft legislation. One area of difference that I think is important has to do with archiving of data. The RFP allows as a bid option the maintaining of archives by the contract owner, with the Federal Government having the opportunity to take over and maintain an archive if the private sector fails to do so.

The draft legislation assigns this responsibility to the Department of Commerce and it also appears, although I can't—I'm not certain of my interpretation that at the moment we wouldn't have the option of being selective about what was archived and that perhaps the intent now is that all data be archived.

My own experience with data base would suggest some latitude being selected. It's a good idea, no matter who's archiving the data.

We feel that the bidder should be given the opportunity to propose operation of an archive, rather than eliminating it. At least it's a possibility for commercialization. This is always—archives is always a very difficult issue in almost any technical area. We asked the National Commission on Library Sciences to prepare some recommendations for us on this issue. Their report's due in in a couple of months and we think that'll be a useful input, one that people perhaps would want to pay attention to.

The draft bill, as I understand it right now, also requires the provision of MSS-type data. I think it would require it for about 9 years, if my arithmetic is right. We have Landsat D, which one hopes would last at least 3 years, and then there'd be a 6-year period after that. It's not clear to me that there's a demand for MSS data that stretches 9 years into the future.

My advice would be to let market demand decide what sensors are going to be on. D' will certainly have MSS on it. Follow-ons to D', in my view, should be configured in a way that's responsive to whatever the market demand is. That might include MSS data. If so, well and good. If it doesn't, I think that's reasonable, too. We should do what people are most likely to buy.

That's the end of my comments, sir. Perhaps you have questions.

[The prepared statement of Mr. Kammer follows:]

STATEMENT
OF
RAYMOND G. KAMMER, JR.
CHAIRMAN, SOURCE EVALUATION BOARD FOR CIVIL SPACE
REMOTE SENSING

BEFORE THE

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE, RESEARCH
AND ENVIRONMENT
AND
SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS

COMMITTEE ON SCIENCE AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

NOVEMBER 8, 1983

Mr. Chairman, and Members of the Subcommittee:

I am pleased to be here today to testify on the commercialization of civil land remote sensing.

I would first like to describe the current status of the Administration's Landsat commercialization activities as reflected in the Request for Proposal (RFP), which was recently released for public comment on October 21, 1983 by the Source Evaluation Board for Civil Space Remote Sensing (SEB). In the RFP, the Government is seeking proposals from interested parties for transfer of the U. S. Civil Land Remote Sensing Satellite System by a sale or lease or through some other arrangement. If this transfer takes place, the Government may contract with the private owner/operator for certain data streams and

services and/or make over-the-counter purchases of particular products. The Government would require contractual assurances of routine availability and timeliness of certain of these data. The Government would also purchase data products as the need arose. An offeror must bid the satellite system, the associated ground-control system and data preprocessing systems as a single package for the Landsat operation.

The RFP anticipates two phases, a transition period in which the current in-orbit U.S. satellite and ground systems would remain in operation, and a second in which the satellites and ground systems would be those of the commercial operator. Offerors are encouraged to respond not only to the basic requirements, but to propose alternatives incorporating new technology or innovative approaches which could improve service or reduce cost. The RFP is designed to protect both national security and international commitments. The technical requirements for quality, distribution and delivery of data are covered in the RFP. Because the U.S. Government is not likely to be the sole or even the most important customer for land remote sensing data, the specifications on how a future operator will do business are not extensive. However, the operator is encouraged to continue Federal Government policies vis-a-vis Landsat data.

Our primary objective is to assure that land remote sensing becomes a viable private-sector enterprise not

hampered by excessive regulation. The Source Evaluation Board has identified no need for a new regulatory scheme or authority in order to enforce stipulations for the RFP and the resulting contract. Nothing in the solicitation is intended to restrain an offeror from pursuing other related business opportunities which are not within the scope of the solicitation -- for example, providing specialized services to customers. The Government does not intend to limit itself to purchase data or services only from the successful bidder under this solicitation.

Your draft legislation, "Land Remote Sensing Commercialization Act of 1983," addresses a number of very important issues. However, many of these are also included as bid items in the RFP so that vital business and market development data can be obtained for evaluation of possible options. Therefore, I feel that your legislation is premature, in that it selects from among the options one approach to each issue. I do not mean to imply that the selection made is necessarily improper; rather that it was made without the benefit of the data that the RFP can provide. I would thus suggest that a more informed decision can be made next spring at the end of the RFP process.

I will now comment on the five issues contained in your letter to Secretary Baldrige of October 27, 1983.

Issue One addresses the extent of Government oversight, regulation and responsibility required during future private operation of land remote sensing systems.

A careful analysis of all existing oversight regulations has led the Board to the conclusion that, with one exception, no new regulatory scheme or authority is necessary to enforce the stipulations contained in the RFP. The current antitrust regulations, international trade controls, national defense reviews, communication frequency allocations and launch approvals all provide the sufficient regulatory apparatus. Essentially all other stipulations can be contained in normal contractual arrangements between the U.S. Government and a contractor. One exception to this conclusion is that the Government may need additional authority to impose civil penalties if a successful bidder fails to meet any of the national security or international requirements outlined in the RFP.

Issue Two touches upon the impact of the proposed provisions of the draft legislation on U.S. international relations and national security.

With respect to national security, we found no significant difference between requirements in the draft RFP and the draft legislation.

The requirements in Title II of the draft legislation dealing with international relations are more restrictive than in the draft RFP.

We have proposed that the contractor continue U.S. Government practices and consult with the U.S. Government prior to changing any foreign operations. Section 204 of the draft bill appears to require that after the expiration of current foreign ground station contracts, those contracts must continue exactly as configured. We feel that the owner/operator should have the opportunity to evaluate the market potential of international requirements and come to the Government if it desires to make changes. We do not know whether changes in current international arrangements would make good business sense and, therefore, we feel we should not legally obligate mandatory compliance with them. Bidders should have an opportunity to propose alternatives.

Issue Three has to do with the plan for transition between Government operation and full private operation as well as the effect that this transition would have on data continuity.

The major difference between the draft legislation and our draft RFP is section 201(d), which would prohibit the transfer to any contractor of title to the Landsat system or any part thereof. This prohibition is overly restrictive in our opinion. It is unlikely that the transition-phase contractor would choose to purchase any or all of the Landsat system, but that is not precluded by the RFP. If a bidder proposed to acquire title through some transfer arrangement, we feel that should be considered and be a part of the bid evaluation. Protection of the

U.S. Government from contractor failure is adequately covered in the oversight and regulations aspect of the RFP, so that continued title to the equipment is not necessary.

Issue Four asks about the reasonableness of criteria proposed for evaluation of industry bids.

We find that the criteria specified in the draft legislation are very similar to those proposed by the SEB for bid evaluation. The RFP states that the most important factor is understanding the requirements, followed in importance by the commercialization plan, international requirements, national security requirements and technical management in that order, with all remaining factors being equal.

The draft legislation also mentions as a criteron any conflicts of interest which could obstruct non-discriminatory access to data. Although the intent of this provision is not entirely clear, it is our opinion that conflict of interest and data access are adequately covered by existing antitrust regulations and should not be an evaluation factor.

Issue Five focuses on the wisdon of maintaining an "open skies" policy and the extent to which such a policy might adversely affect commercial opportunities in land remote sensing.

One of the important purposes of the RFP is to provide data with which to address this question. At this time there are no business plan data that permit an accurate answer to this question. Current Government practice is non-discriminatory

distribution of all data. We are requesting that bidders maintain this policy unless they propose changes in their bid or in the operation their system. The proposed changes would have to incorporate an explanation of the commercial opportunities in a change of policy. The major difference between the RFP and the draft legislation is that we provide the bidders the opportunity to propose changes, whereas the draft legislation does not permit that discussion to occur. We feel that marketing data in foreign countries may be profitable and therefore, in all likelihood, important to successful commercialization. We are, however, providing the opportunity for alternatives to be proposed for consideration. These alternatives would not be implemented without the approval of the Department of State. Data from the bids will provide a basis for discussion of this issue. We feel this discussion should take place before any legislative effort to codify what has historically been a government policy position.

It appears that the draft legislation precludes legitimate opportunities for a bidder to propose a two-tier data provision policy in which data at an enhanced level for a specific purpose could be ordered on a non-discriminatory, but time-limited exclusive basis.

Issue six addressed any other matter which in your view is inadequately addressed in the draft legislation.

An additional area of rather substantial difference between the RFP and the draft legislation is the archiving of data. The RFP allows, as a bid option, the maintaining of archives by the contract owner, with the Federal Government having the opportunity to take over and maintain an archive if the private sector fails to do so. The draft legislation appears to require that the Secretary of Commerce maintain the archives, either directly or by contract. The ultimate result may be the same in either case. We feel that the bidder should be given the opportunity to propose operation of an archive and the way in which they would handle that archive, instead of eliminating it as a component of commercialization. In addition, we have asked the National Commission on Libraries and Information Science (NCLIS) to prepare recommendations on the archiving issue; it will be available in the near future. Archiving is a very costly activity, and thus one that has to be examined carefully for market potential and cost effectiveness.

Mr. Chairman, we have made other comments of a technical nature on the draft legislation which I believe have been transmitted to your staff. I would be glad to answer any questions you may have.

Mr. VOLKMER. The gentleman from Florida have any questions?

Mr. MACKAY. Mr. Kammer, a recent article in "Aviation Week & Space Technology" on the future plans of a new remote-sensing company called SPARX, S-P-A-R-X—it was reported that executives of that company expect to have the Government support them in departing from the policy of nondiscriminatory access to data.

[The article from "Aviation Week & Space Technology" follows:]

SPAS Team to Compete With Landsat

Washington—Shuttle Mission 7's demonstration of the West German SPAS shuttle pallet satellite and its innovative solid state Earth-imaging system has resulted in the formation of a U. S./European consortium that next August will initiate shuttle/SPAS commercial remote-sensing flights in competition with the higher cost U. S. Landsat and French Sp : Earth imaging systems.

The Sparx Corp., a new company to manage the SPAS remote-sensing project, has been formed by the consortium made up of the Communications Satellite Corp., a New York investment firm called the Stenbeck Group and Messerschmitt-Boelkow-Blohm, which built both the SPAS and its MOMS imaging system in West Germany.

The endeavor is aimed at creating a fleet of shuttle-launchable and retrievable SPAS pallet remote-sensing satellites.

While the SPAS was attached to the orbiter Challenger during Mission 7 last June, the MOMS imaging system successfully demonstrated civil remote-sensing using a push-broom scanner charged coupled device (CCD) system to photograph South America and other areas (see p. 62). The MOMS designation stands for modular optoelectronic multispectral scanner.

The three companies are prepared to put $10 million into the project in 1984 and somewhat more in 1985. The group hopes to achieve an operational system in 1986 with an initial investment of roughly $50-75 million.

Depending upon user interest, the Sparx Corp. plans eventually to manage a fleet of 5-10 SPAS shuttle pallet satellites using the flexibility provided by shuttle retrieval to exchange and modify a range of sensing systems that could be placed on SPAS pallets flying repeatedly. Comsat would be the primary operator of the Sparx system.

Use of the space shuttle for this project to obtain proprietary 65-ft. resolution images of Earth targets for commercial companies and developing nations is expected to provide a commercial test of the Open Skies principle outlined by President Dwight D. Eisenhower 25 years ago.

The Open Skies principle is that any entity has the right to overfly and photograph any area from space, even though the land owners or nation in which the photographic target lies may not have concurred with that data acquisition or be aware of the uses to be made of the imagery.

In addition to competing with Landsat and Spot, the shuttle system also will be in direct competition with the Space America commercial remote-sensing satellite project that is planning to launch free-flying spacecraft on Space Services, Inc., Conestoga 2 boosters (AWST Sept. 26, p. 87).

Initially, Sparx Corp. plans to keep the MBB-built pallet satellite with its solid state imaging system attached to the space shuttle instead of going the more difficult route of developing a free-flying spacecraft, according to Klaus P. Heiss, chairman of Sparx, and a partner with the Stenbeck Group.

By about 1986-87, when Sparx polar orbit shuttle missions launched from Vandenberg AFB, Calif., are planned, the company expects to use an uprated SPAS design as a free-flying platform that would be deployed from the shuttle, then retrieved 6-12 months later for data pickup or instrument changeout, according to Paul Maughan, director of Comsat remote-sensing development. The SPAS already has demonstrated its free-flight capability during Mission 7 (AWST June 27, p. 14).

Significant features of the Sparx Corp. project are:

- Division of labor—Comsat Corp., which has been studying for years how it could actively penetrate the commercial space remote-sensing field, will market the project to potential users and establish a U. S. data management center to process the imagery for those users. MBB will provide the SPAS and MOMS hardware and its integration with the space shuttle. The Stenbeck Group will provide financing. A European data management center could be established later.
- User markets—The project will work with individual users, but the primary Sparx marketing effort will be directed toward forming "regional partnerships" with organizations that would buy large blocks of the SPAS returned data then in turn sell that data to individual users. Developing "resource countries" such as in South America will be prime candidates for this business approach. Australia, Africa, Middle East nations and the People's Republic of China are other good candidates, Heiss said.
- Ground targets—Imagery for mineral and petroleum exploration is expected to dominate early Sparx operations, although Heiss believes agricultural data will be the most important driver over the long term. A key aspect of the initial flights will be to see if the company can acquire such commercial users, Comsat's Maughan said. Although Comsat expresses optimism about user interest, it will not know the business outlook for sure until testing the market on the initial flights. If the interest does not develop, the business approach being pursued should limit Sparx losses.
- Business approach—An important aspect of the project is the stepped development approach the shuttle/pallet combination affords, Maughan said. The approach is to use an existing pallet design on which sensors can be added. If the market does not demand new sensor de-

- Cosmos 1,505—The reconnaissance satellite was launched Oct. 21 into a 377 x 210-km. (234 x 130-mi.) orbit inclined 72.9 deg.
- Cosmos 1,506—This navigation spacecraft was launched Oct. 26 into a 1,026 x 969-km. (637 x 602-mi.) orbit inclined 83 deg. The new satellite is a replacement for the Cosmos 1,304 navigation satellite now failing in orbit.
- Meteor 2—The weather spacecraft was launched Oct. 28 into a 901 x 760-km. (600 x 485-mi.) orbit inclined 81.2 deg.
- Cosmos 1,507—This ferret ocean surveillance spacecraft was launched Oct. 29 into a 449 x 431-km. (279 x 267-mi.) orbit inclined 65 deg.

velopment, new sensors will not be added, keeping costs and risk below what development of a complete free-flying Earth resources satellite would entail. Since the SPAS pallet launch costs will be charged at only about 10% of the payload bay total, individual mission costs will be lessened.

- Flight schedule—MBB and the National Aeronautics and Space Administration plan to fund flight of the SPAS and MOMS on shuttle Mission 11 in late January for additional push-broom scanner research. The first Sparx Corp. commercial flight has been scheduled for Mission 17 next August when the SPAS will use the MOMS scanner to photograph targets for commercial users. Sparx has given NASA $100,000 to hold that flight reservation. Two additional market development SPAS flights are planned in 1985. Sparx hopes to be operational in 1986.
- Payload of opportunity approach—Heiss believes it is significant that the company has been able to schedule a shuttle flight within a year of conceiving the first commercial mission. He views this as a demonstration of shuttle payload flexibility that Sparx Corp. can use to its advantage by providing short preflight lead times, bringing both cost and data benefits.
- Joint endeavor option—The three Sparx Corp. partners are discussing with NASA the possibility of a NASA/Sparx joint endeavor agreement. If such an agreement is worked out, the company could receive a cost break or free initial launches in exchange for additional market development activities that would stimulate the overall U. S. space commercialization effort.
- Data exclusivity—Users sponsoring SPAS/MOMS data acquisition will be guaranteed that those images will remain proprietary, unlike Landsat data that is available to any user. Heiss believes this could be the first commercial test of the Open Skies principle, possibly raising objections from some countries. Heiss expects any challenges to the Open Skies principle will be fought not only by Sparx but by the U. S. government.
- U. S./European cooperation—The two sides have traditionally been in direct competition. With a cooperative effort formed under Sparx, the benefits of having representation on both sides of the Atlantic should enhance the market outlook, Heiss said.
- Additional SPAS capabilities—The current MOMS instrument has a two-wavelength capability covering the 0.5- and 2.3-micron range. This system will be used on the first commercial flight next year, but the plan for the future is to augment SPAS pallets with additional instrumentation, Maughan said. On the second commercial mission in 1985, it is possible a large film camera could be carried with the MOMS, and on the third mission later that year a possible stereo capability could be added.

The Mission 17 flight next August has other aspects that the Sparx project will use to its advantage. The mission will carry the OSTA-3 payload that includes a reflight of the synthetic aperture Earth resources radar first flown on shuttle Mission 2.

Maughan said the Sparx team wants to compare the MOMS data acquired on that flight with the radar data, and that future SPAS Earth resources pallet missions might include a radar capability.

The Itek large-format Earth resources film camera also is to be flown on Mission 17, a flight planned for a 57-deg. orbital inclination overflying a majority of the world's landmass.

One option for a later SPAS Earth resources mission is to fly two additional MOMS sensor packages each with two additional wavelengths. These additions, combined with the initial MOMS, could provide imaging in six wavelengths, which could be augmented further with a film camera system.

A more near-term modification to the MOMS system that flew in June will be placement of recorder and control facilities in the orbiter cabin so the astronaut crew can control acquisition of the data, and even more importantly change the data tapes as large amounts of imagery are recorded.

The initial flights will be launched out of Kennedy Space Center into equatorial orbits where the ground targets will be fewer.

Sparx believes that this will be adequate for the initial development phase of the project, but it needs to move into Vandenberg-launched polar orbit operations relatively early in the program because of the 100% Earth coverage polar orbits provide.

The possibility of flying the SPAS pallets as cargo on Defense Dept. shuttle missions will be discussed with the department as a means of broadening the launches available to place the pallets in orbit.

Stay times of 6-12 months are envisioned for the free-flying pallets.

The objective of demonstrating multiple sensor-carrying capability early in the program is to arrive in 1986-87 with a more market-oriented system, Maughan said. □

Mr. MACKAY. Are you aware of their plan for proprietary data exclusivity? In other words, that they would have data that was not available to other users?

Mr. KAMMER. I've read the same article that you've read, yes, sir.

Mr. MACKAY. Do you think that their plan is consistent with past and present U.S. international policy?

Mr. KAMMER. No, sir.

Mr. MACKAY. They seem to think from the article that the Government supported their position. Are you aware of that support?

Mr. KAMMER. Well, I can only speak from my own experience, which is not directly to this proposal, but when we debated in the Interagency Board, the policy, NASA was a very strong advocate of being much firmer about nondiscriminatory data access than, in fact, we've been in the RFP where we raised the question, we say, are there changes that might need to be made, and we go on to say maybe we won't be able to make them, but we'd like to at least hear about it.

NASA said, "No, we don't think we should ever make any changes in it." That position, I know, has been expressed by the Administrator of NASA in writing. In fact, I've been the recipient of it so it's hard for me to see how the Aviation Week article suggestion would be very consistent with what I know to be senior management policy in NASA.

I think it'll be interesting to see what NASA has to say about the article.

Mr. MACKAY. I see. All right. So you're not aware, then, that there has been any commitment made or that there is any Government support for this company's proposal to depart from the policy of nondiscriminatory access to data?

Mr. KAMMER. I'm not only not aware of it, but the things that I do know about with respect to NASA policy would suggest that it's not consistent with their policy.

Mr. MACKAY. All right. Thank you, Mr. Chairman.

Mr. VOLKMER. The gentleman from Florida, Mr. Lewis.

Mr. LEWIS. Thank you, Mr. Chairman.

Mr. Kammer, what would be the cost of the archives as presented in section 602 of the bill? Have you looked at that carefully?

Mr. KAMMER. I've been trying to get a fix on the cost of archiving for my own purposes in the RFP as well, which is almost the same issue, and I believe that it would cost on the order of a million dollars a year.

Mr. LEWIS. A million dollars?

Mr. KAMMER. About a million dollars a year to do it.

Mr. LEWIS. I see.

Mr. KAMMER. It might be that it would be possible to support that through retrieval from the archives, but archive demand retrieval is very modest right now.

Mr. LEWIS. In your opinion, would the data under the bill cost the Government more or less than it does now?

Mr. KAMMER. Well, if the Government specified that MSS data might be provided—had to be provided for a long period of time, perhaps 9 years, and there wasn't a marketplace for that data, then the Government would have to bear the total cost of that and that would be an increase in cost.

Mr. LEWIS. Do you think the bill has adequate protection for the taxpayers' investment?

Mr. KAMMER. Yes, sir.

Mr. LEWIS. Would you elaborate on that a little bit?

Mr. KAMMER. The stated purpose of the bill is to encourage commercialization, as I understand it, while setting certain conditions that would stop a potential commercial vendor from doing things that are perceived, I think, by the drafters of the bill not to be in public policy interest.

I think that if you look at it in the context of the purposes of the bill, not all of which are ones which I support, that the steps that are taken are logical, they flow from the original intentions and are a pretty good job.

Mr. LEWIS. Do you see a need to add something to the bill which would protect the Government in the event the operation of this system in title III exceeds the cost anticipated by the contractor?

Mr. KAMMER. I'd very much like to do that but I've confronted the same issue in the RFP and one of the problems that you have is when you go in, if you've signed a contract with anybody, and this happens an awful lot of times with Government contracts, everything's always fine, the cost is going to be very modest, it's all quite acceptable, and you sort of, an inch at a time, get dragged deeper and deeper in and it's very hard to extricate yourself because you're in the position where you've got an operating system, there are people using it, and the incremental cost that's posed to you looks modest to the clientele in comparison to you pulling out altogether.

I don't know how to achieve that objective and since so many other people have had the same problem in other contracts, I'm not sure there is a real solution to the problem.

Mr. LEWIS. Well, there is a concern out there on the street now with the problems of Government contracts, as we've seen with various companies, as to the anticipated cost far exceeds the original estimate and this comes out year by year and the taxpayer has to pump more money in and I'm sure this is going to be a very severe concern with the Landsat system if it goes full commercialization, so you're telling me you're not sure, but you don't feel that there should be anything added to the bill as a protective covenant against this?

Mr. KAMMER. Well, I—I can tell you what we contemplate doing in the RFP, in the draft RFP. For the Landsat D' system, which will, we hope, be launched in February, we had suggested that a cost-plus type of contract would be what would happen, which is to say that there'd be equipment that the Government put up and we wouldn't expect people to take responsibility for the operation of that if it incurred additional cost. Well, we designed it; we put it up; I guess it's our problem.

However, for any follow-on system, our suggestion was that a flat fee be paid. The Government would negotiation that up front and that would be the end of it. The additional financial responsibility would be borne by whomever a successful bidder on the contract was, and they'd know that going in. We wouldn't make provision to add additional money.

Also, the clientele would also know that. At least it would give us a lot of arguing room if things got kind of rough later. We would have made our point very strongly at the beginning.

Mr. LEWIS. What if you get into the situation where the contractor can't afford to meet the cost obligations?

Mr. KAMMER. I think you confront a public policy issue of a very awkward sort. There's clearly a strong opinion on the part of a lot of people in the administration and a lot of people in Congress, there's an inherent good to the Nation in operating an Earth resources satellite system. If we were in a situation where there were only operator and he was about to go under for some reason, I think a decision would have to be made. I think there'd probably be time to make it when that happened, but as to whether or not it was worth it to the country to somehow prop him up or we were willing to let him go under.

Mr. LEWIS. That concerns me. Thank you, Mr. Kammer.

Mr. VOLKMER. Several questions. In regard to the RFP, since you've addressed our bill, I'd like to address the RFP for a little bit. You did address in your statement, of course.

Now, as I review your statement, and some cursory review of the RFP, I do not find any time period in which the contractor is going to perform our Landsat system that we have ongoing now. Is that correct?

Mr. KAMMER. That's exactly right, sir. The way we've posed it in the draft RFP is that a bidder must propose to operate the system that the Government has up at the time, presumably D', and he must make a proposal for a follow-on system. The nature of that follow-on system is at the discretion of the bidder and our selection of a winning bidder would be in large part based on the attractiveness of the follow-on system contemplated.

Mr. VOLKMER. All right, and is the contract—do you envision the contract, then, that would be ongoing for 6, 9, 10 years, 15 years? How long is this thing going to last?

Mr. KAMMER. It seems to me that my expectation is that you'd have different types of contracts as time passed. Despite the optimism that a number of people have about the size of the market in the future, the current market is very modest, perhaps $15 million at the moment.

That is not likely, in my opinion, to change during the lifetime of D', let's say the next 3 years. In all likelihood, the operation of an initial follow-on device, which perhaps might last another 3 years, is going to require considerable support from other than the marketplace, which is to say Government subsidy in some form.

After that, if the market has, in fact, grown, one would hope that the Government either can get out of the subsidy business or reduce the subsidy markedly. The sort of model that I had was Government subsidy goes down over time with a series of contracts, perhaps 3-year contracts, one after another, and the contribution of the private sector, which arises from income from the marketplace, goes up.

Mr. VOLKMER. All right. Now, can we envision one other possibility? Mr. Walklet has proposed that if certain things happen, we could have private going into the same sector. In other words, private corporations, individuals, investors, et cetera.

Let's say we have a competitive system 4 years from now or 3 years from now and that competitive system is able to provide to the Government the data that all that the Government needs. By that time that's all we're looking at besides subsidies, right, on the——

Mr. KAMMER. That would be very appealing. I don't——

Mr. VOLKMER. Under—under the RFP, your—the Government could purchase that data from the competing system, could it not?

Mr. KAMMER. Yes, sir. I also would be personally very adverse to providing whatever Government support there is in the form of exaggerated payments for the data. The reason why I think that is a poor way of providing the support is it would tend to set a data price for the rest of the marketplace that was artificially high and probably discourage the use of data.

[Discussion off the record.]

Mr. VOLKMER. That's correct. It has been pointed out by staff that we do have provision in our legislation that a nondiscriminary—the selling of that data, and the RFP will make the same type of——

Mr. KAMMER. The RFP, at the moment——

Mr. VOLKMER. Is silent on that, is it not?

Mr. KAMMER. Well, it—what it—what we say now is that the current Government policy is just what you've described in the draft legislation and that we—it's our opinion that it's in the best interest of the United States for that to be the policy of the country. However, we would like to hear from bidders on changes that they think are necessary to provide a more commercial market. We'll consider those changes, but any changes would require an approval by the Government before they could be made, and that is a difference between our draft RFP and your draft legislation.

Mr. VOLKMER. It's also correct that under the RFP, if the contract so proposed, and was supposedly the best contract that you could get, end up with a guarantee of Government purchase, too.

Mr. KAMMER. We——

Mr. VOLKMER. A certain amount.

Mr. KAMMER. We have not specified that in the RFP.

Mr. VOLKMER. But you have not said that it wouldn't be there, either. I mean, they could make a proposal for—that could be in a proposal.

Mr. KAMMER. Sure they could, yes, sir.

Mr. VOLKMER. It's not beyond the RFP.

Mr. KAMMER. That would be within the scope of the RFP.

Mr. VOLKMER. Now, it is clearly—the RFP clearly states, and your statement does, also, that the RFP calls for a sale/lease, whatever, the total system——

Mr. KAMMER. Yes, sir.

Mr. VOLKMER [continuing]. Not just the—end-use system, the data system

Mr. KAMMER. Yes, sir.

Mr. VOLKMER. Would a proposal just for acquistion of the data be—be on the RFP?

Mr. KAMMER. Yes, sir, it would, the way it's written now. Obviously we debated this issue.

Mr. VOLKMER. In other words, we're not going to see—I'll interject here—we're not going to see any responses to the RFP just in regard to data acquisition?

Mr. KAMMER. The way the RFP is written, someone could put in such a response, but it wouldn't fit. It wouldn't respond to the——

Mr. VOLKMER. It wouldn't be considered.

Mr. KAMMER. It would not be considered. The reason for this is—well, I'll give you my own—my own view, which is the view shared by the whole committee. If the Government ever commits to support the hardware and turns loose the—the data part, it's my own personal opinion that the Government will be in that role for a long time into the future, maybe indefinitely.

Most of the cost lies in designing and launching and commanding the satellite. Most of the income, obviously, arises from how you massage the data. If we've separated it so that all the cost lies on the Government and all the income-generating possibilities lie in the private sector, how will we at a later data persuade someone that they would—that it would be a good deal somehow for them to take on additional cost is very hard for me to imagine.

Mr. VOLKMER. At the time the request for information was being returned and sent out and everything in the Halbouty report, didn't the—didn't Halbouty report recommend at this time just the data base, not the whole system?

Mr. KAMMER. I can't remember for certain if the Halbouty report did, but there were a number of responses to the RFI most even that suggested that. In addition, I believe the Grace Committee recommendation was to suggest that, also.

Mr. VOLKMER. And I believe some members on this committee——

Mr. KAMMER. Yes, sir.

Mr. VOLKMER [continuing]. Also.

Mr. KAMMER. Yes, sir. If I were in the value-added data business, I would also be an advocate for that position.

Mr. VOLKMER. Well, the reason I think that some of us suggested it because we were looking to expand the markets and as you expand the markets, therefore, you're going to provide a better environment for somebody to put up their own satellites eventually, and the question that we've all had is, you know, whether anybody's going to come in at this time to try and purchase and just take it over and operate it without any Government help. I think we all agree that's not going to happen.

Mr. KAMMER. Certainly not in the short term. It simply doesn't generate the funds to pay for a hardware system.

Mr. VOLKMER. Fifteen million isn't going to take care of it.

Mr. KAMMER. It just won't do it, I agree.

Mr. VOLKMER. OK. Now, what does the RFP provide with respect to the contracts for the foreign ground stations?

Mr. KAMMER. It's really not——

Mr. VOLKMER. And in response to that, to come in and say, "We will no longer honor those contracts," or "We will honor them" or "We will take it on for 3 years"? Is it wide open?

Mr. KAMMER. It's really not very much different, actually, from your draft legislation. The memorandum of understanding that we have with the various countries that have systems now specifies

that the agreement will be in force for 3 years or until NOAA no longer is responsible for this system, whichever comes first.

So it was envisioned in the memorandum of understanding that at some point, commercialization might take place. This information is also provided in the—in the draft RFP, and then we go on to say that any changes that would be contemplated by the bidder should be noted as part of their response to the RFP and we'll talk about it.

Actually, that's one of the significant income-bearing sections of the—of the system right now. We get about $5½ million out of the—from fees from the other countries for the system, and in terms of incremental cost for the government operating this system, it's very, very modest, on the order of a few hundred thousand dollars, probably, to make that information available to them.

So it's hard for me to imagine a commercial operator not being delighted to continue to service those individuals.

Mr. VOLKMER. Do you envision any possibility of the—I know you can't speak for the Secretary, but for the position that you see it, from where you personally see it, of a satellite beyond No. 5 going up by the Government?

Mr. KAMMER. Well, I can tell you what we've proposed, which has no support outside the Department of Commerce within the administration. We have suggested, where "we" include the Secretary of Commerce, that it would be prudent to purchase the long leadtime parts for D″ while we're debating this issue because to do a D″ is approximately a 54-month operation. D′ is not going to last 54 months unless we are awfully lucky.

The long leadtime parts, if they were purchased now, could give you a fighting chance of reducing the time. The clock on 54 months doesn't start until a commitment is made. Maybe we could reduce that clock to 4½ years, save a year, something like that.

That's been proposed. It's currently being considered by the rest of the policy apparatus in Government, but we—we haven't been encouraged.

Mr. VOLKMER. How else would we be able to insure data continuity for the private sector that's out here on the user end?

Mr. KAMMER. It—either one is going to have to do a D″ or one is going to have to invent another system, perhaps a more modest system. D″, a direct copy, let's say, of Landsat, is not a perfect solution by any means. It has a lot of technological aspects to it that probably aren't necessary for the market that exists now.

But in the absence of the Government in some form producing another system, we have the option of SPOT, we have a number of other options that could come to pass, private-sector entities that currently contemplate launching systems in 1985–87. If they're successful, conceivably we'd even have a domestic supplier. Your judgment's as good as mine as to how successful they're likely to be.

Mr. VOLKMER. Do you envision that persons now in the position on enhancing the data will be able to use basically the same hardware, software, 4 years from now or 5 years from now to continue on that enhancement?

Mr. KAMMER. Not if they're either—there's two reasons that I can imagine. One——

Mr. VOLKMER. I mean the new data that'll be——

Mr. KAMMER. Right.

Mr. VOLKMER [continuing]. Coming out in that time.

Mr. KAMMER. Right. If—if an individual is analyzing the data for technical reasons because he's an academic, for instance, certainly not, because he would be far from competitive. If he's analyzing the data for economic reasons, certainly not, because he would be far from competitive.

My answer is the same for the two cases that are, I think, sort of grossly described why people would use the data. The ability to squeeze information out of the data is going to go very fast with the improvements that are available in hardware and software from computer.

Mr. VOLKMER. In your opinion, our legislation does provide for basically open skies, nondiscriminatory sale of data. Can we have a healthy market for that data and for enhancement, et cetera, within that type of policy framework in your opinion?

Mr. KAMMER. I don't know. The reason for raising the issue in the RFP is I have had people fix me with their steely, sincere gaze from all parts of industry and go all over the place on that issue. I—there—people believe very strongly on this issue, whichever way they believe, but any point of view is represented, and seemingly legitimately. You know, they're not just wild people.

Mr. VOLKMER. If we don't provide basically for, you know, equal access to that data, do we have any difficulty in the question of other nations again raising the viewpoint that you're scanning our land and our resources, et cetera, without our permission and without our consent, and we can't even—let's say, and we can't even get the data?

Mr. KAMMER. Well, I—I obviously queried the State Department with some care on this issue and their view is that it's entirely reasonable and appropriate for the—for us to go ahead and consider the issue. When specific changes, if any, are suggested by the private sector, then the State Department would turn to and try to figure out whether or not this is critical or isn't critical.

Mr. VOLKMER. Well, thank you very much, Mr. Kammer. I appreciate your being here today and I'm sorry it took so long to get there.

Well, wait a minute, one more I would like to ask. In the RFP, how do you address the national security question?

Mr. KAMMER. We have a classified annex to the RFP——

Mr. VOLKMER. All right.

Mr. KAMMER [continuing]. Which sets the terms and conditions to preserve national security. It was written in concert with the Department of Defense and other people and I think, to everyone's satisfaction, does accomplish that objective.

Mr. VOLKMER. Thank you very much. The two subcommittees will now adjourn. We'll reconvene here tomorrow at 2 p.m. to hear additional witnesses on this issue.

Thank you very much, Mr. Kammer.

[Whereupon, at 12:30 p.m., the subcommittees were adjourned, to reconvene at 2 p.m., Wednesday, November 9, 1983.]

THE COMMERCIALIZATION OF METEOROLOGICAL AND LAND REMOTE-SENSING SATELLITES

WEDNESDAY, NOVEMBER 9, 1983

HOUSE OF REPRESENTATIVES, COMMITTEE ON SCIENCE AND TECHNOLOGY, SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT AND SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS,
Washington, D.C.

The subcommittees met, pursuant to recess, at 2:16 p.m., in room 2318, Rayburn House Office Building, Hon. James H. Scheuer (chairman of the Subcommittee on Natural Resources, Agriculture Research and Environment) presiding.

Present: Representatives Scheuer, Volkmer, Nelson, MacKay, Andrews, Walker, McGrath, and Bateman.

Mr. SCHEUER. Today marks the second of 2 days of hearings on draft legislation aimed at effecting a rational transition between Government operation of land remote-sensing systems and fully private operation of these systems.

This legislation was drafted because Chairman Volkmer and myself—and I—share a deep concern that the United States is about to fritter away its technological leadership in an area where, over the next 20 years, we expect to see tremendous global commercial expansion and competition.

In this case, our industrial expansion is threatened not by a lack of resources, or by a lack of creativity, or by a lack of productivity. We are threatened solely by Government inaction at the highest policymaking levels.

Earlier this year the administration seemed to be telling us that the best way to keep the United States in the forefront of land remote sensing—of land remote sensing—was to kill funding for the Landsat program and to sell our civilian weather satellites.

Due in large part to the efforts of Mike Andrews and others on this committee, that foolishness finally is way behind us.

Now we must grapple with the real issue of this debate, which is how best to ease our land remote-sensing capabilities into the private sector.

Concurrent with our consideration of this legislation, the administration is preparing a request for proposal, an RFP, to solicit industry bids on present and future land remote-sensing systems.

Let me say that, in the light of the crying need for a coherent Government policy in land remote sensing, I do not find it inconsistent that both the legislative and the executive branches should

be working in parallel to resolve this major issue. In fact, I was greatly heartened in reviewing the testimony of Ray Kammer, Chairman of the Source Evaluation Board, to note that Mr. Kammer finds many parallels and few major inconsistencies between his efforts and the provisions of this draft legislation.

We look forward, both the chairman and myself, to working with Mr. Kammer and others in the administration to insure that, as Congress articulates a coherent policy for commercializing land remote-sensing activities over the next 6 to 12 months, the administration aggressively implements that policy.

It would be unfortunate to see a repetition of the circumstances surrounding the Metsat commercialization issue, the weather satellite commercialization issue, where, despite repeated signals from the Congress, the administration continued to pursue a policy which had little, if any, support in either House of Congress on either side of the aisle.

We as a nation will be able to compete successfully with the French and the Japanese in this area of land remote sensing only if the administration, Congress, and U.S. industry pull together.

The draft legislation that we're considering today charts one possible course, only one possible course, for reaching our common goal of U.S. technological leadership in land remote sensing. It's not the only possible solution, and most members of the committee, myself included, remain perfectly open-minded on this subject, open to other suggestions as to how we can commercialize this technology most expeditiously, most cost effectively, most productively.

I expect that today's witnesses will help us greatly in providing suggestions for fine tuning this legislative proposal.

We will hear from Chairman Jack Brooks, chairman of the Government Operations Committee, who has played a highly constructive role in focusing attention on the effects which the transfer of Landsat might have on our national security and our international relations. And we'll hear from Congressman Brooks, who is now sitting in on a conference with the House and Senate conferees, as soon as he's able to get here.

In the meantime, we'll hear from representatives of three companies which might have an interest either in operating a private sector system or in insuring such a system: First, our old friend, Deke Slayton of Space Services, Inc., accompanied by Ms. Josephson. Second, we'll hear from C. A. Schmidt of RCA, and, finally, we'll hear from Mr. Brian Hughes of the U.S. Aircraft Insurance Group. We look forward to all of their testimony.

Now, first, let me yield to the cochairman of these series of hearings, Chairman Volkmer, who chaired the opening hearing yesterday and who has played a very thoughtful and creative role in designing and in implementing these hearings.

Congressman Volkmer.

Mr. VOLKMER. Thank you very much, Mr. Chairman.

Yesterday we had testimony that described the present situation as "chaos," and recommended that we clarify the policy situation. Of course, that is exactly what we're trying to do in the draft legislation.

Other parts of yesterday's testimony indicated that there is some confusion about whether our bill would "freeze" technology at the level of the multispectral scanner, called MSS. Our draft bill does not freeze technology at any level, and this misunderstanding is unfortunate.

Let me very briefly explain what the bill does provide:

Based on a great deal of testimony from previous hearings, we have decided that "data continuity" is very important. Indeed, testimony yesterday reiterated this importance. But one must ask, What does the term "data continuity" mean? It has to be given an operational meaning.

Our bill defines this term in reference to the data that has been available in the past. We say that "data continuity" means making data available that is at least as good as, and at least as plentiful as, data that has been available earlier. This is a straightforward definition of "continuity."

But the term "at least" is very important. We are specifying minimum levels. Better data can be supplied, as long as it is compatible. And within national security considerations, we would allow any advanced senor technology to be used to gather data.

Above all, the bill does not contemplate any guaranteed Government purchases of data.

Mr. Chairman, thank you for the opportunity to make this statement. I look forward to today's witnesses. I'm sorry that I will not be able to be here for the first part because I have to leave and go back over to the floor, where we have some legislation on there that has very serious importance for my district, and I'll be right back as soon as I can, probably about within less than a half—about half an hour.

Mr. SCHEUER. Very good. Thank you.

Any statements from my Republican colleagues?

Congressman Ray McGrath of the Empire State of New York?

Mr. MCGRATH. Thank you very much, Mr. Chairman.

I'd like to also welcome our expert witnesses today, Deke and Diana—it sounds like a rock-and-roll duo—on this most important of subjects.

I had one question for you, Mr. Chairman. In your opening statement you said something about the—our capabilities in remote-sensing being frittered away by—and I couldn't glean the meaning—by either "Government inaction or Government in action." [Laughter.]

Which one was it—Government inaction or Government in action? [Laughter.]

Mr. SCHEUER. You remind me of the chap who stopped somebody on the street and said, "Now I'm interested in getting your views on a political matter. Which do you think is worse—ignorance or apathy?" And the answer came, "I don't know and I don't care." [Laughter.]

"Government inaction"—one word.

Mr. MCGRATH. All right. Just as long as we get that one straight.

Mr. SCHEUER. Right.——

Mr. MCGRATH. Yesterday's hearing——

Mr. SCHEUER. Although, to tell you the truth, I don't want to make this a partisan disposition——

Mr. MCGRATH. Then please don't.

Mr. SCHEUER [continuing]. But, judging from the last 2 years, one could have a hardy debate on the question of whether in this era Government inaction is worse or better than Government in action. But, anyway, we're talking about Government inaction.

Mr. MCGRATH. All right. In that case, then, we can presume that we can resume.

Mr. SCHEUER. All right.

Mr. MCGRATH. Thank you.

Mr. SCHEUER. OK. So, first, we'll call upon our old friend, Deke Slayton of Space Services, Inc., one of the seven original astronauts, a man who really needs no introduction to me or anybody else, a man with "the right stuff."

Please—and Ms. Josephson—please come to the table.

I would like to ask unanimous consent that a copy of the bill be inserted in the hearing record of yesterday right after Congressman Volkmer's opening statement.

Being no—hearing no objection, so ordered.

All right. Mr. Slayton and Ms. Josephson, please proceed as you wish, and your prepared statement will be included in the record in full. So, if you care to, you might just chat with us informally as if we're all sitting in your living room sharing your scotch.

STATEMENT OF DONALD K. [DEKE] SLAYTON, PRESIDENT, SPACE SERVICES INCORPORATED OF AMERICA, ACCOMPANIED BY DIANA H. JOSEPHSON, PRESIDENT, SPACE AMERICA

Mr. SLAYTON. All right, sir.

Mr. Chairman, we are delighted to be here with you today, you and the subcommittee. We are honored that you invited us to present testimony.

I might run over this thing briefly because I do not know whether anyone's had a chance to read it or not, and then we'll deviate as required.

Space Services did enter into a joint venture last June with The American Science and Technology Corp. and the Aeros Data Corp. in Bethesda and formed the joint venture "Space America." And, of course, Diana Josephson is president of the AS&T Corp. and of the joint venture, which is the reason we have her here today.

AS&T was formed in 1981 to develop a private sector Earth resources satellite program as a follow-on to Landsat D', which I think is very pertinent to discussions here today. AEROS was formed in 1982 to provide a value-added data processing program, and processing data from Landsat and any other remote data sensing spacecraft, aircraft, or whatever. And the idea, of course, was to do this better than anybody else is doing it at the present time. SSI was formed with the same philosophy, and that was to develop a new generation of low-cost, expendable launch vehicles and other low-cost space systems. So that's the reason we got together. We thought our objectives matched each other fairly well.

The Space America program is designed to provide the first commercial U.S. land remote-sensing system, and we think we're making it low cost by the use of state-of-the-art spacecraft, sensors, and computer technology. We'll be able to provide 80-meter and 40-

meter stereo imagery in eight visible bands, using advanced charge coupled devices.

What we can do with CCD's, of course, is get rid of the complexity of the moving systems that are on the Landsat, we reduce the size, enabling smaller and lighter spacecraft. The result of that, of course, is a cheaper system. There's an order of magnitude reduction in the cost. We think the Landsat D' is somewhere in the ball park of a $300 million system, and we believe that we can provide one for about a tenth of that cost. We do have a detailed comparison for the record (fig. 1).

COMPARISON OF SPACE AMERICA AND LANDSAT

	SPA	LANDSAT
INSTRUMENTS	Two Sensors 8 Bands 6 Bands at 80-meter Resolution; 2 Bands at 40-meter Resolution	Two Sensors 11 Bands 4 Bands at 80-meter Resolution; 7 Bands at 30-meter Resolution
	Stereoscopic Coverage	No Stereoscopic Coverage
	Solid State, Charge-Coupled Device Sensor--No Moving Parts	Optical Scanning Mirror Sensor--Moving Parts
	320 km Swath Width	185 km Swath Width
MISSION LIFE	5 Years	3 Years
PROJECTED COST	$30 Million	$300 Million
CONSTRUCTION SCHEDULE	2 Years	4 Years
LAUNCH VEHICLE	STS or Conestoga II	STS or Delta 39-20
PROJECTED LAUNCH COSTS	$10-$15 Million	$35-$75 Million
COMPATIBLE WITH EXISTING GROUND STATIONS	Yes (Requires X-Band Upgrade)	Yes (Requires X-Band Upgrade)
DATA TRANSMISSION	X-Band at 18 Megabits per Second	S-Band at 15 Megabits per Second X-Band at 85 Megabits per Second
INDUSTRIAL TEAM	Space America, Ball Aerospace, Honeywell	General Electric, Hughes, Fairchild Space Company
REPEAT CYCLE	18 Day; Adjacent Swaths	16 Day; Skipped Swaths

We have selected Ball Aerospace as a spacecraft manufacturer, so we know exactly what our costs are related to our spacecraft. We've contracted with Minneapolis Honeywell to build the sensors, so we have those numbers nailed down very well. And I'm pleased to announce that, as of today, we expect to have an arrangement with Bendix Field Engineering Corp. to join us in response to the Landsat RFP. They have a great amount of expertise in operation and development of ground stations, and we look forward to that relationship. They are an element of the Allied Corp.

Our spacecraft is compatible with both the shuttle and the Conestoga II launch vehicle, which we are in the process of developing. And we don't have any parochial viewpoint. We're going to launch on whichever of those gives us the most economic system. The reason, I might say at this point, that we are, in fact, building our own launch vehicle is because we envision a difficult time getting earth-sensing-type spacecraft into the kind of an orbit that they'll want to get into on a timely basis with the shuttle. The shuttle generally will go where the big payloads go, and that's the reason that we're proceeding with the development of the launch vehicle.

We have some models in the back of the room here. Just to put things into perspective, the sensor is, in fact, a life-size full scale model. The other models are scale models.

In addition to the space segment, Space America is developing a next-generation data processing software system. We call it CEDIS, and we combine satellite, aircraft, and conventional data to produce advanced information products for worldwide users.

The Space America program is designed to meet the demands of data users worldwide, including Federal agencies in the United States, American industry, the academic community, foreign ground stations, foreign governments and industry, and the international community in general. It is designed to expand the existing markets by providing stereoscopic data in near-real time and at prices that will enable many additional customers to use our raw data worldwide, as well as the CEDIS products. Our market surveys convinced us that there's a large and a growing market for both the raw data and the next generation information-planning products.

We firmly believe that a commercial land remote-sensing industry will attract the necessary private financing, and in the proper time scale. And I think we need to say more about that later. Consequently, we are pursuing all possible options to expand the market for land remote-sensing and information products.

We believe that our approach to a low-cost, market-oriented remote-sensing system will become a reality with the help of the Congress.

Last spring, immediately preceding the administration's announcement of its intention to commercialize both land remote-sensing and weather satellites, we initiated a stock offering for the Space America program. There was a misunderstanding of what the highly publicized opposition really meant. The opposition was over weather satellites, but the land satellites got caught up in that, and, as you can imagine, we had a very tough time convincing people that it was different, and, therefore, a very tough time trying to raise money to do a commercial program.

The commercial venture people obviously are concerned about what Government intervention means, Government competition. So, we applaud the committee for taking the lead in developing a policy for the U.S. Government that will be meaningful to the private sector and, hopefully, help us to raise money to do commercial ventures in the future.

We have reviewed the bill's definition of the Government's baseline data requirement contained in section 301 and have concluded that our system qualifies under the subsection (b) of that bill.

Our sensor uses a newer technology than the MSS sensor on the Landsat, and we plan to carry a combination of the MSS, thermatic mapper, and Coastal Zone color scanner bands at the 80- and 40-meter spatial resolution.

We support section 302, which requires data of MSS quality, as defined in section 301, but allows the contractor to make data available of a higher quality, and we hope we are going to make higher quality data available.

As I mentioned previously, the Space America System is market-oriented, so that band and resolution improvements will be ongoing as we develop our second and third satellites. Any business must constantly upgrade its products to remain competitive. Our current schedule calls for our first launch 2 years after we obtain FCC transmission licenses and other Government approvals.

We originally planned to transmit in the S-band, which is the MSS frequency, but we did change very recently to X-band, which is the thematic mapper frequency, when we were informed via the RFP that the Government does not plan to make the S-band frequency available after Landsat D'.

We will, however, transmit at 18 megabits, rather than the TM rate of 85 mega bits per second, so that the data processing time, cost and equipment are the same as for the MSS data. This adjustment is just one of the many changes we have made as we have developed the first private sector land remote-sensing satellite system. The Federal agencies have been extremely helpful during this period, but the lack of clear policy guidelines on the Landsat issue has led to delay and confusion. We hope your legislation will improve this situation.

We believe that the criteria in section 203 for evaluation of bids are adequate and fair. However, we would list continuity of data as a separate criteria, and we think that probably is the most important criteria and should be listed as No. 1. It's our view that data continuity is the most important aspect of the Landsat commercialization issue. Only with the assurance of data continuity will there be the confidence necessary to justify user investments in data receipt and use.

The certainty of a future U.S. land remote-sensing capability will enable the marketers of raw data and of value-added products to compete with subsidized foreign competitors.

NASA developed the world's first land remote-sensing system, Landsat, using taxpayer moneys, and we believe that those taxpayers should benefit from their investment through the development of a new U.S. industry. Once again, there are many foreign groups exploiting U.S.-developed technology, and we don't believe we can afford to lose this new industry to subsidized foreign competition.

We note that the selection criteria set forth in your bill differ from those listed in the draft RFP to commercialize Landsat. It would be helpful if the RFP and any legislation were consistent, so that an industry bid would be evaluated under similar criteria by both the administration and the Congress.

We are assuming that the final RFP will not exclude our type of approach for transitioning from the Government to private sector systems. However, uncertainty surrounding the RFP process and its relationship to the legislative process are of major concern to those of us intending to bid on the final RFP. We hope, and note the fact it is happening, that Congress and the Department of Commerce are coordinating their efforts so that these efforts will dovetail.

We have expended substantial resources on our development of a private system up to this point. We'd like to see our efforts to provide a space system for one-tenth the cost of Landsat come to fruition.

I think that's all we have of the formal presentation. We're available to answer questions on any part of this or whatever else relative to the subject.

Mr. SCHEUER. Excuse me. Would you repeat that last sentence and maybe elaborate on it a bit? You hope to build your commercialized Landsat for one-tenth of the cost of what?

Mr. SLAYTON. One-tenth the cost of the existing Landsat D' system. We are informed that that is approximately a $300 million system. We have contracts with Ball Aerospace for spacecraft and Minneapolis Honeywell for sensors that add up to about a tenth of that cost.

We should make it clear it is not an identical system. It does have most of the same characteristics. It's a mixture of the thematic mapper bands, and the multispectral scanner bands. It is a little bit lower resolution. We do have stereo which Landsat does not have.

We are proceeding to develop an IR sensor to go with it, which presently does not exist in solid-state technology, and we would then have basically the equivalent of Landsat. Those sensors should be available next summer. They are under development by contract through NASA. So at that point in time we believe we will have essentially an identical system.

Mr. SCHEUER. Ms. Josephson?

Ms. JOSEPHSON. I am here to answer questions.

Mr. SCHEUER. OK. Let me ask a question or two.

Do you think this is an opportune time for the kind of legislation that we're proposing or do you think, for any reason, that we're premature? Are we ahead of schedule? Should this be considered 6 months to a year from now?

Mr. SLAYTON. No, sir, Mr. Chairman. I think you're probably behind, if you want my opinion. The reason is, in my opinion, the Landsat that is up there today is fading rapidly. We don't know how long it's going to operate, but it's obviously not running at full steam, and I think most people that we've talked to, and certainly we, believe that this country needs to retain a presence in space in the remote-sensing area. Of course, we have the Landsat D', which is on standby, and will be launched early next year, but the ques-

tion is what happens next. The Landsat D' is a 2- to 3-year lifetime machine at the present time. It'll take 4 years to build a follow-on to Landsat D'. We think, if we're going to retain a presence in space, we need to do something very, very rapidly to insure that that happens.

You can postulate a worst case that says we lose the Landsat D' on launch and we would have no land remote-sensing capabilities in this country.

Not only is the Space America System available for a tenth of the cost, but we do it in 2 years instead of 4 years. That's the reason we feel we've got an option, a very viable option in this area.

Mr. SCHEUER. Let me ask you a couple of questions about the specs that presumably will be in the RFP——

Mr. SLAYTON. Yes, sir.

Mr. SCHEUER [continuing]. And in the bill. Section 302 of the bill provides that the Secretary contract for the availability of certain minimum quantities and qualities of data, and I want to ask you about whether these specified quantities and qualities are reasonable and cost effective and doable at a reasonable cost.

Let's take the quality of the—the quantity of the data first. We specify that the level of 1983 Federal purchases should be available. Would this requirement be burdensome on the contractor? If you were the contractor, would you have to build a system larger than you would ordinarily choose to build, larger than you would ordinarily think would be cost effective and could do the job or would you, of your own volition, want to build a system large enough to provide this much data?

Mr. SLAYTON. Well, sir, I'll let Diana follow on with the answer to that. My opinion, again, is that we would have absolutely no problem at all handling that quantity of data. At the present time I think the U.S. Government represents something around 25 or 30 percent of the total market, and, of course, our intent is to—if we happen to win this particular RFP—would be to go out and market the dickens out of this thing and build a much bigger market than exists today, and make this thing pay for itself. And we would look at Federal purchases as being a relatively small piece of the total market.

Diana, you——

Ms. JOSEPHSON. Yes; The system we're planning, or have under contract provides worldwide data, as does the Landsat system. So that if we're providing worldwide data, that's what we're providing and people, users, will use the portions of that data that are useful to them. So we would not change the space segment at all, depending on the level of use by the Federal Government.

Mr. SCHEUER. All right. What about the quality? The bill provides, as you said, for MSS-equivalent data in order to provide continuity. Is this a burden? Would it limit the technology that you might otherwise want to use?

Mr. SLAYTON. No, sir, not at the present time, because we are providing many of the MSS bands. The IR is the one which, of course, is thematic mapper. We do not have the capability to provide IR with a solid-state sensor today, but that's the one we hope to have by midsummer next year.

Diana, do you want to add to that?

Ms. JOSEPHSON. Yes; there are two issues with MSS data. One is resolution and the other is the information content of the bands. We plan to provide the MSS-type resolution at 80 meters, but also provide a couple of bands at higher resolutions, which can be overlaid with the other 80-meter data, so that people can use it either at 80 meters, if that's what they want to do, or at 40 meters. So that part of it is no problem.

We do plan to provide more bands than MSS currently provides. We're going to provide eight visible bands. We've interpreted the bill to mean when it says, "functionally equivalent," that the bill is looking at the information content of the specific portion of the spectrum.

One thing I think everybody agrees upon in the user community is that the thematic mapper bands, which were selected as a result of 10 years' experience with the MSS portions of the spectrum, give very useful information. So we plan to provide those bands as well as a mixture of MSS and coastal zone color scanner bands.

The information content, you know, will be functionally equivalent to the MSS data, but we think we're providing improved service.

Mr. SCHEUER. So you don't see anything about this provision, either as to quality or quantity, that would limit the development of technology?

Ms. JOSEPHSON. No.

Mr. SLAYTON. No, sir.

Ms. JOSEPHSON. The bill does provide the contractor or the operator with an option to provide higher quality data when they make the market judgment that that should be provided.

Mr. SCHEUER. Congressman McGrath?

Mr. MCGRATH. Thank you very much, Mr. Chairman.

If I could adequately characterize your proposal, it would be simply—and answer yes or no—that yours is a truly commercial enterprise. You're in the process of developing your own launch vehicle. You're going to launch your own vehicle. You're developing your own sensor. And what you're really saying to the Government is, "Get the hell out of our way." Is that correct?

Mr. SLAYTON. That's the path we started on; that's correct. And—but, unfortunately, with the uncertainties relative to what the Government's posture was, we ran into some fairly gross difficulties in raising the funding to pull this thing together, and so that has been part of the problem. We think if there's some clear direction here—we recognize that there's got to be some serious concern on the part of the Government to maintain the continuity of data, and we are new kids on the street and there's going to be some nervousness about us, you know, going in and doing that as a sole thing. So certainly the Government, we think, will want a transition phase, and we think that's the right thing to do, to transition from a Government-run system to a private one in an orderly fashion.

Mr. MCGRATH. Well, that's provided for in the bill.

Mr. SLAYTON. That's provided for in the bill, yes, sir.

Mr. MCGRATH. And you would agree with that?

Mr. SLAYTON. Sure.

Mr. MCGRATH. One of the things that differs between the RFP and the bill is the whole area of open sky policy. How would this open sky policy in the bill affect your ability to market your product?

Ms. JOSEPHSON. We plan to market to everybody. Our satellite is designed to provide data of use to many different groups of users: cartographers, geologists, agricultural users, people who want to know about water resources, and so on. And we plan to comply with the open skies policy.

We want to maximize the number of customers so that we can reduce the prices to users.

Mr. MCGRATH. Yesterday we heard from Mr. Thatcher from the World Resources Institute, who indicated that some foreign users are concerned that commercialization may lead to data being priced beyond the reach of some of the foreign users. You also indicated that a commercially oriented system may be designed to meet the needs of highly sophisticated users, such as oil companies, and et cetera, and ignore the needs of developing countries. How would you respond to something like that?

Ms. JOSEPHSON. We hope to provide data for less cost than Landsat rather than more. We currently are having discussions with the foreign ground station operators, for example, whereby we would provide a year's supply of data to them for $500,000 a year as opposed to the Landsat program's $600,000 a year plus a per-scene fee for every scene that they use.

So I think his concern is not being borne out by our market projections.

As I said before we've designed a satellite to provide data to a wide variety of users. If you look at the projected market for Landsat data, it is the agricultural arena which is going to be the repeat user. The geologists—I think everybody would agree—tend to come in and buy data for the world every time there's some new information and then they go in and they study it, study it and get the uses that they want out of it. The agricultural people like to look at crops today, next week, the following week, and so on. So clearly for a long-range business, the agricultural market is very important, and we will not be ignoring it.

Mr. MCGRATH. I know you are aware, and probably have read and pored over the RFP. Do you have any comments on it that you'd like to share with the committee or submit them for the record?

Ms. JOSEPHSON. Yes. We have one concern with respect to the RFP that we will be relaying. We'll be happy to submit more detailed comments for the record.

[The material follows:]

SPACE AMERICA
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BETHESDA, MARYLAND 20814
(301) 656-0434

November 21, 1983

Mr. Ray Kammer, Chairman
Source Evaluation Board for
Civil Remote Sensing
NBOC #1, Room 300
11420 Rockville Pike
Rockville, Md. 20852

Dear Mr. Kammer:

On behalf of Space America, I am enclosing comments on the draft "Request for Proposals for Transfer of United States Civil Operational Remote Sensing Satellites to the Private Sector", as requested in your October 21, 1983, letter.

With respect to the questions raised in your letter, our response is as follows:

- We believe that the overall market, not the Federal market, should drive a commercial Landsat program and applaud your efforts to achieve this goal. However, in several instances, the RFP appears to state the Federal government's future needs and desires in terms of hard requirements. This is very confusing. See more detailed comments.

- The Federal government's purchases of data should not be restricted to any one supplier. However, the data it acquires should be restricted to internal Federal government use. In addition, the data it acquires for R&D or international assistance purposes should not be redistributed by principal investigators or by recipient foreign governments.

- We strongly believe that the RFP should be silent with respect to market structure. Specific marketing arrangements should be left to commercial owner/operators.

- The split between using Federal government assets and future data purchases is clear. We welcome the opportunity to propose an innovative transition approach. See more detailed comments.

- We will answer your question about good business arrangements for the follow-on activities in our response to the RFP itself.

- We believe that rigid contract terms will be self-defeating. See more detailed comments.

- We applaud your concept of minimum Federal government involvement outside the contract itself. We are not clear that this approach is as yet fully realized in the RFP. See more detailed comments.

If we can be of any further assistance to you in the preparation of the RFP, please do not hesitate to contact us. We look forward to receiving the final RFP when it is released.

Sincerely yours,

Diana H. Josephson

Diana H. Josephson
President

Enclosure

November 21, 1983

SPACE AMERICA'S COMMENTS ON THE DRAFT
REQUEST FOR PROPOSALS

OVERALL

1. A separate RFP should be prepared for the Landsat system so that there is no ambiguity as to the requirements that must be met by offerors.

2. The Landsat RFP should be consistent with the draft Landsat commercialization legislation now being considered by the Congress. For example, the evaluation criteria in the RFP and the legislation are not consistent so that offerors cannot be assured that the entity selected by the Administration will also qualify under the legislation. Similarly, the terms of the contract are not identical and archiving requirements differ. It is not clear whether the Federal government is going to continue the "open skies" policy, as the draft legislation provides, or permit proprietary data, as suggested by the RFP. The term "transition period" is used very differently in the RFP and in the draft legislation. The bill makes it clear that offerors should be capable of generating MSS-type data and that government R&D should not compete with commercial operators. The RFP is silent on these issues.

3. We disagree that the "heart" of the solicitation is the technical proposal. We believe that the "heart" of the Landsat solicitation is to commercialize land remote sensing from space. The RFP, insofar as it refers to Landsat, has been overly impacted by the inclusion of the Metsats, where clearly the first statement is true.

We recommend that Section VII and Section VIII be reversed, and that the phrase "Government Contract Experience" be dropped from Section VIII's title, in order to emphasize this point.

4. Current Section VII is very confusing. This confusion seems to result from the fact that Section VII governs the technical aspects of both the bid for the takeover of the existing Landsat D system and the bid for the follow-on commercial system, but never differentiates clearly between these two very different phases of the Landsat commercialization process in its statement of the technical ground rules for a bid. This confusion is compounded by the inclusion of a discussion of one market segment only, the Federal market, in a section entitled "Technical Requirements".

We would recommend that Section VII be limited to the bid for the takeover of the Landsat D system, and that all requirements, including market requirements, if any, relevant to this bid be included in this section. In turn, Title VIII should govern the bid to provide the follow-on commercial system and, similarly, should include all requirements, including market requirements, if any, relevant to this bid. Any discussion of the Federal market that is not a requirement should be relegated to an appendix. Offerors would then be able to understand clearly what is required in order to submit a successful bid for the two major phases of the Landsat commercialization process.

In lieu of this proposal, Title VII should be reorganized into two parts; the first dealing with the Landsat D system and the second with the follow-on commercial system so that, once again, offerors can clearly understand the requirements for a successful bid. The requirements relevant to each of these parts should be included. Any discussion of the Federal market that is not a requirement should be relegated to an appendix.

CONTRACTUAL ARRANGEMENTS

1. The RFP should permit a more flexible contract approach than now appears possible. The key issue involved in the Landsat commercialization process is the successful transition from government to offeror financing and assumption of risk. It is difficult now to predict the precise moments in time at which key phases of this transition will be completed. Neither the Federal government nor the offeror should be locked into a rigid timetable for this process. Rather, an offeror should be free to propose, and the Federal government to accept, a financial basis for shifting from an initial contract mode to subsequent modes. The RFP should be broad enough to permit such a flexible contract approach.

INTERNATIONAL ARRANGEMENTS

1. The Federal government's review of the offeror's international negotiations and business relations must be spelled out more clearly. Specific guidelines and criteria must be available, so that the operator can make appropriate business decisions in preparing its bid. For example, can the Federal government refuse a system operator permission to terminate the flow of data to a foreign ground station which is refusing to pay for the data?

2. We believe that the offeror should be able to represent its interests directly at CLOS meetings, rather than being represented by the Federal government. Similarly, the operator should be able to deal directly with other foreign and international governmental entities.

OFFEROR EXPERIENCE

1. Section VIII discourages new entrepreneurs from responding to the draft RFP. It appears to be heavily weighted in favor of established large companies, particularly those with prior Federal government experience. This weighting ignores the fundamental purpose of the Landsat RFP which is to help establish a new high risk industry. U.S. industrial history is replete with successful examples of new start-up firms formed to enter high risk business arenas. Years of government contract experience may well indicate the absence, rather than the presence, of entrepreneurial skills.

We recommend that the experience of individuals and proposed sub-contractors be considered in addition to corporate experience so that start-up companies can be evaluated fairly.

2. Why are three examples of offeror's "experience in acquisition" relevant to this RFP? What does this mean?

EVALUATION CRITERIA

1. The evaluation criteria deserve further explanation. For example, is their ranking weighted? If so, does this weighting remain the same, regardless of the commercialization phase being evaluated? Are cost reductions more significant than technological advances? How much risk is the Federal government willing to take? Is the offeror's technical capability really more important than its entrepreneurial capability?

MISCELLANEOUS

1. The requirement for Federal government approval of foreign travel is burdensome and counterproductive. Offeror's worldwide marketing plans are of prime importance to the commercialization process. Offerors should be free to make appropriate judgements with respect to foreign travel.

2. Restrictions on changes in key personnel are similarly counterproductive in a commercialization process. Certainly after any initial O&M phase, the offeror should be free to operate as a business, with personnel decisions made on the basis of performance.

3. We do not believe that a FCC rulemaking is required. Why is DOC's support before the FCC being delayed until the RFP process is complete? Why cannot DOC support all potential operators before the FCC as and when they file?

4. We support the draft legislation which provides that the Federal government will continue to archive land remote sensing data, rather than the contractor as proposed in the RFP.

5. Is leasing the Landsat D system still a possible option? The "Objectives of the Solicitation" include leasing, yet Section X-A.1 is limited to the purchase of these assets, as is Section III-8, line 3.

6. The RFP does not state the amount of the contract liabilities to be assumed by the Landsat system offeror upon contract in 1985. Which contract liabilities will remain outstanding and for how much?

7. Article XLVII of Section V does not make clear what "Landsat imagery data with 'TM or MSS'" is to be delivered during the "transition period". The cross-reference to Section VII is not helpful since Section VII describes the Landsat D system but does not specify the data to be provided.

8. The cross references in Article XXI, Section V, are inaccurate.

9. Section III-5(c) requires each offeror to indicate its "relationships of foreign interest". Please clarify further.

10. An RFP release date during the holiday season is unrealistic. We recommend you defer release until January 2, 1984.

Ms. JOSEPHSON. In the business evaluation section the criteria seem to be very weighted toward people who have experience being big Government contractors previously. There are a large number of questions about your prior experience, how long you've been in existence, et cetera. It's our view that in commercializing, high risk areas such as the one we're talking about, it is probably going to be the smaller companies that are going to step up to the challenge rather than the big companies. We feel at the moment that the evaluation section, is far too heavily weighted, toward those who have been in existence for a long time and are big companies. We will be relaying our comments to the administration.

Mr. SLAYTON. I think in general that we're happy with the RFP. I think it's well done.

Ms. JOSEPHSON. Yes. Other than that we have some other minor comments.

Mr. MCGRATH. If we put this Metsat controversy behind us and the administration came out squarely for commercialization of remote-sensing Landsat, do you think it would help you with your ability to raise the capital funds necessary to develop your——

Ms. JOSEPHSON. Yes.

Mr. SLAYTON. Yes, we think so. That added a lot of confusion to the picture, and certainly it will clear the air considerably to have that resolved. Obviously, until we test it, we won't know how much impact it will have but it certainly has to help.

Mr. MCGRATH. I have no further questions, Mr. Chairman.

Mr. SCHEUER. Thank you.

Congressman Nelson of Florida.

Mr. NELSON. Thank you, Mr. Chairman.

Good afternoon.

Do you know of any technology that would not be developed if remote-sensing satellites of the future are to be in the hands of commercial interests than if they were in the hands of the U.S. Government?

Mr. SLAYTON. No, sir; I don't. The way I would envision the R&D on the remote-sensing happening in the future, I think NASA has a continuing role to do research and development in all elements of space, and I would hope they'd continue to do some in the remote-sensing area, also.

But, by the same token, I think the private companies that get into the business, once they're up and running, certainly have an obligation to do some research and development on their own. I don't know of any other viable entity in the economic world that can survive without doing some research and development pointed toward the future. I think the companies have an obligation to do that on their own and to try to develop new technology.

But the Government certainly may add some R&D related to goals other than the commercial ones that should be done—I'm thinking in terms of interplanetary-type things as an example: lunar sensing or Mars sensing, whatever.

Mr. NELSON. Is that the incentive for NASA that you're talking about to continue their R&D for remote sensing?

Mr. SLAYTON. The incentive?

Mr. NELSON. Yes.

Mr. SLAYTON. I would think so; yes, sir.

Mr. NELSON. You said NASA ought to continue R&D, and my question was going to be, well, what is the reason that NASA would continue that?

Mr. SLAYTON. Oh, yes. I would think that would be their motivation primarily in relation to the interplanetary-type aspect unless NASA is going to stay in the Earth remote-sensing business. If you gentlemen made the decision that NASA should run remote sensing, then I would say they should stay in it from an Earth remote-sensing point of view, but if they're going to back off from that goal, I would think the requirements of the private sector should be the driver on research and development for new systems.

Ms. JOSEPHSON. As we develop elements. that we see are going to be required in the future, I could see some very creative arrangements being made with NASA and the companies, similar to the joint-endeavor agreements that currently exist. We would do part of the R&D and they would do part of the R&D, or we would agree that we would do it and they would give us a free shuttle flight. We clearly recognize that we have to have a commitment to R&D in the private sector, but we do see a continuing role for NASA in R&D, particularly in the basic R&D, the more expensive R&D which is, more difficult for the private sector to fund.

Mr. NELSON. Aside from the R&D, do you envision, as you get ready to respond to the RFP, that you're going to propose that your private enterprise absorbs all of the cost or are you looking at a joint shared-cost arrangement with the U.S. Government?

Mr. SLAYTON. I think we're prepared to go almost any way that makes sense at this point in time. If there was a decision made today that the Government was going to totally drop out of the remote-sensing world and let it fall where it may commercially, we probably could go out and raise funds to get a purely commercial system up and going. We don't know that to be a fact, but I guess we think that this country needs to essentially guarantee itself for remote-sensing capability. If you're really going to do the RFP, unfortunately, there's no way to keep the Government out of it through the transition phase. What has as yet been undefined is how you would define the end of that. We think that can be defined as a function of crossing from the red into the black. The system today is obviously costing the taxpayers a lot of money to run, and we would hope at least a private operator could get it to the point where it's paying its own way, and then develop some formula from there to convert it to commercial operations.

Mr. NELSON. Thank you, Mr. Chairman.

Mr. SCHEUER. Congressman Bateman?

Mr. BATEMAN. Thank you, Mr. Chairman.

If I may, having gotten here late, and pouring through the statement, I'll withhold any questions. And if anything occurs to me as requiring an answer, I'll submit it later, if I may.

Mr. SCHEUER. Congressman Mike Andrews?

Mr. ANDREWS. Thank you, Mr. Chairman.

I'd like you, Ms. Josephson, just to explain a little bit in your response to the previous question about the role you see NASA playing in R&D. What extent is that? How—what do you mean when you say, basic R&D? What are you talking about?

Ms. JOSEPHSON. In R&D there is basic research where you try and examine general principles, which often take a long time to sort out and take a lot of money. Then there is applied R&D, when you take the results of that basic investigation and you translate it into commercial terms.

NASA has played a very major role in basic R&D, and I think, in our national interest, it should continue to do so. The area of applied R&D is where there is, you know, a real role for private sector systems, in partnership with NASA or, you know, on its own.

I already have a little list of things when we can afford to do so, I'd like to let out some R&D contracts on, things that I think our system will need down the road.

Mr. ANDREWS. One suggestion that has been made in the future for a single-purpose satellite to be built, and one user group, like a group of oil companies, high-tech companies, and then pooling their R&D money together to fund it. Have you all explored that? And I'll ask both of you that question. Has that been explored by you, and what are the possibilities, and what's the market—what is the market feasibility?

Mr. SLAYTON. Well, sir; yes, we have explored it. So far, we have not come up with anybody that wants to sign up. We did have a concept early on. We thought if we could come up with the right sensor system that would be proprietary to an oil company, that we might find a bunch of oil companies who want to have their own dedicated satellite. We still think that's a potential, but at this point in time we have not had anyone sign up. We know some of the oil companies are doing some very basic research on their own in terms of sensors, and obviously keeping this proprietary, and they aren't sharing it with us or anybody else. But we consider it possible that they may come to us one of these days and say, "Hey, we have this set of sensors, and would you put them on your spacecraft and launch them for us?"

Obviously that deviates from the open skies policy. When you do that, you're talking proprietary-type data, but that's what they're going to want. That issue will have to be addressed at some point.

Mr. ANDREWS. You were one of the few companies that have testified before our committee as to what you consider to be the great market possibilities in the marketplace, and we've had many witnesses that have come before our committee, frankly, and testified as to the limits of the marketplace in the 1980's. How do you square your market data with testimony that we've heard before?

Ms. JOSEPHSON. I think in part a lot of the people who have looked, you know, for the Government at the market have been doing so in light of the costs of the Landsat system. I think you would agree that if you're having to pay back the capital costs, of a Landsat-D-type satellite, at $300 or $400 million, the market does not exist today to do that.

What we have done is talked with various user segments, and we've talked with potential user segments that have never been approached before. Our experience is that, for many commercial entities, we are the first people ever to come and talk to them about remote-sensing data as a commercial tool which they can use in their business.

The role of Government is not to market its services. So the uses of Landsat data have developed in the absence of any real marketing. It's remarkable in one sense that they've developed as far as they have. Our belief is that, through an aggressive marketing program, through focusing on new market segments, which haven't yet, been approached, we can expand the market sufficiently to support the kind of capital costs that we're talking about, using the new technologies.

Mr. ANDREWS. Thank you, Mr. Chairman.

Mr. SCHEUER. Mr. McGrath?

Mr. MCGRATH. In your testimony you said you are going to develop a sensor with a 40-meter to 80-meter bands there. What about users who require resolutions lower than 40?

Ms. JOSEPHSON. Do you mean 10, 20, and that kind of resolutions?

Mr. MCGRATH. Something—10, 20, or——

Ms. JOSEPHSON. Yes. Let me say one thing about our system first, and then answer your question. Our technical people are working right now, using our existing sensor design, to increase the data resolution to something like 30 meters through some special electronic techniques, that they're examining. So I think our high resolution band may become higher.

Essentially, we made some market decisions. The existing market is an 80-meter market. Everybody's computers around the world are sized to deal with 80-meter data. Just about all the capital equipment is on that scale, so that is where we start as a commercial business.

We provide one channel of 40-meter data. You can overlay the 80-meter data on the 40-meter and with a very insignificant loss of information, you can get the information on the 80-meter bands at 40 meters effectively. You can get stereo, in other words, 40-meter stereo in all the bands.

There is a tradeoff between the cost of capital equipment and operational costs to users and the data rate at which you broadcast. We are making a commercial decision that at this point a low-data rate is very important for users.

Now for the users who want high resolution data, if and when we become convinced that there is a market sufficient to support the increased capital costs of putting up a space segment with those capabilities, we will do it. We want to sell to users.

The high resolution data has only been available for a year, and, as we all know, the thematic mapper transmitter failed early. We don't feel there's been an adequate market test yet of high resolution data sufficient that we feel that we can convince investors. So we will have to move to high resolution data as soon as possible.

Mr. MCGRATH. There's a section in the bill that doesn't require but suggests a recoupment from the contractor to the Government as sort of a payback for the phasein period and the buying of the data. How do you feel about that?

Ms. JOSEPHSON. I think it's a very reasonable approach to the transition period. There are a number of possible approaches to the transition, where there is partial private and partial Government funding. We prefer approaches at that point which enable us to be

as commercial as possible. I think your title under the bill tackles that.

On the other hand, if there is going to be a Government contract for a followon system, we want the opportunity to bid along with everybody else to offer that system if the Government makes the decision to go that way.

Mr. MCGRATH. Just one last question.

The—this whole operation can be broken down into the development of the sensor, the launching, and then the value-added area, the marketing and the synthesizing of the information. If this were broken up into one or two or even three component parts, how would that affect your operation in your company?

Ms. JOSEPHSON. I think there's really only two logical breakouts. There's the space segment with its ground station and the distribution of data from that point, and then there's whatever value-added processing you want to do on the ground.

As far as breaking it out, we currently have a value-added component in our organization. Our sense is that, provided we are not giving ourselves an undue advantage within the organization, which is something that is very easily verifiable, we're not convinced there is a need to have, say, two joint ventures.

Mr. MCGRATH. Well, it would seem to me that one of the reasons that you could offer your service at a lower cost is your capability as being able to launch and deliver into orbit a sensor.

Ms. JOSEPHSON. Yes.

Mr. MCGRATH. And—and if that were—if that were taken away from you in some way or another, that ability, then it would seem to me that your ability to offer it at that rate would be substantially less, or more of a factor, more of a cost factor for you.

Mr. SLAYTON. I guess if you're proposing that somebody else might sell the Government a system of spacecraft, launch, and all of that, and then we might bid on the RFP in operating it—is that the——

Mr. MCGRATH. Well, well, here's——

Ms. JOSEPHSON. No.

Mr. MCGRATH [continuing]. The point, I guess: that there is a transition in the—to operate the existing systems——

Ms. JOSEPHSON. Yes.

Mr. MCGRATH [continuing]. D and——

Ms. JOSEPHSON. D and D'?

Mr. MCGRATH. D and D'. And then there's another phase, a 6-year phase, after that. And you have a competitive edge because you have the ability to launch on your own vehicle and your own sensor, and other companies that would maybe just want the value-added area wouldn't have that advantage. How much of an advantage is that, is I guess my question, and how does that break down into your ability to say, "We can do it at one-tenth the cost of what the Landsat operation is now?"

Ms. JOSEPHSON. The one-tenth the cost does not include the cost of launch. Our spacecraft is shuttle compatible, for example, so we have the option of launching on shuttle if that's the least expensive way or launch on Conestoga. We have not yet made a final decision on that.

Mr. SLAYTON. No. No. We'll make that later on.

But I think the only thing you're implying here—is it a possibility that we might provide hardware and somebody else would be operating it as a Landsat operator? We have considered that as a possible scenario. We'd work whatever piece of it makes sense.

Mr. MCGRATH. Thank you very much, Deke and Diana.

Mr. SLAYTON. Thank you.

Mr. SCHEUER. Congressman Mike Andrews?

Mr. ANDREWS. Mr. Chairman, I don't have any further questions today, but I would like to be able to submit some written questions to the staff to be submitted to our witnesses today.

Mr. SCHEUER. Yes. I think a number of us would like to submit further questions in writing. So I would ask unanimous consent that we do that and that we hold the record open for 10 or 12 days, or 2 weeks at the maximum, for the answers to come in.

There being no objection, so ordered.

Mr. NELSON. Mr. Chairman?

Mr. SCHEUER. Yes?

Mr. NELSON. Could I ask another question?

Mr. SCHEUER. Of course.

Mr. ANDREWS. Could we resolve—is it—do we have 2 weeks to submit questions?

Mr. SCHEUER. Two weeks. No, no, no. Ten days to submit questions. We have to give the witnesses some time to get the answers back.

Mr. ANDREWS. Thank you, Mr. Chairman.

Mr. SCHEUER. If you haven't submitted questions by the end of next week, can we assume that you're out in some faraway place?

Mr. ANDREWS. Mr. Chairman, I'll have my questions in to you, sir.

Mr. SCHEUER. Very good. Very good.

Mr. NELSON. No. You can assume that if you don't hear from him next week that Jim Wright might have him in the Capitol dungeon——

[Laughter.]

Mr. NELSON [continuing]. Because of the continuing resolution.

Mr. SCHEUER. Right.

Mr. NELSON. Mr. Chairman, I want to preface my next question, which is a follow-on to my last, with a statement that somewhere in my viscera I am concerned that the United States not be in a position where we hand over the responsibility for continuing development in a technology and, as a result of that, that we get ourselves in a situation where we can't compete in the future.

Now I first raised this question both publicly and privately with regard to development of technologies with regard to our military, and I have pursued that—those questions both publicly and privately, and I am convinced that probably that technology is going to continue, regardless of what happens with commercialization or not. And that will continue within our intelligence-gathering and Defense Department agencies.

However, I still get concerned. So the question that I want to ask you is, you spoke a while ago about encouraging NASA to continue on its R&D if the whole thing were in the hands of your company. Now on what basis do you say that you would encourage NASA to continue R&D? And what would be the returns for you—what

would be the incentive for you to continue encouraging NASA to do that?

Mr. SLAYTON. Well, Mr. Congressman, I wouldn't personally propose that NASA continue doing R&D on Earth sensing relative to the commercial sector, because I think the commercial sector ought to do for themselves in that area.

But I think there also is a national requirement to do it for the reasons you're alluding to, of a national interest, national defense requirements, for example, where remote sensing may relate to those things that certainly will not be done by the private sector. It needs to be done by either the DOD or NASA.

And as I indicated earlier, I do think NASA has a continuing requirement to worry about interplanetary-type sensing, which may spin back into the private sector and become useful there for a number of reasons and, hopefully, be available to the private sector. But I wouldn't envision NASA spending taxpayer money to develop remote sensing purely for commercial purposes. That's my opinion.

Mr. SCHEUER. Will my colleague yield briefly?

Mr. NELSON. Oh, certainly.

Mr. SCHEUER. Remote land sensing is remote land sensing, and there are whole congeries, a whole vast variety of commercial applications, but, in addition to that, there are very clear Government applications to the——

Mr. SLAYTON. Yes, sir.

Mr. SCHEUER [continuing] The same technology. So it seems to me we're faced with a question, should NASA do—participate in the basic research? And if the basic research is going to produce a more effective remote—land remote-sensing capability, it seems to me it would have obvious commercial and obvious governmental, foreign policy, defense, national security applications. And it seems to me that it might well be that the basic theoretical research might well be a NASA role for the whole variety of applications, commercial as well as noncommercial.

I'm no expert on this subject, but, as one who's been on the Science Committee, I do believe the Government has a basic role in doing pure research, theoretical research, and then letting the private sector pick up on applied research.

Here the pure research, when it's applied, is going to be productive, both from the point of view of commercial uses and from the point of view of very clearly classic Government uses. When you're talking about national security and foreign policy implications, you are talking about Government uses. So it seems to me that the decision ought to be made basically as to whether there's a role here for NASA to help with the pure research, and then let the private sector perhaps come in on the applied research.

Bill, do you want to take issue with that?

Mr. NELSON. Well, I would only raise this question, Mr. Chairman: Recognizing that there's an extraordinary competition for dollars that are available in the Federal pie, and recognizing that NASA has an ambitious program for the future, and that it's going to fight for every dollar that it can get, I would be concerned that the situation were created whereby NASA would not come forth with a budgetary request for continued R&D in remote sensing and

might say, "Well, we're just going to turn over all of this to the commercial sector."

I'm not—I don't have the answer as to whether or not that is or is not in the best interest of the country, especially if DOD is still doing its thing, which I think it will.

Ms. JOSEPHSON. I think that NASA will continue to support the meteorological programs, also, which are going to remain governmental programs, and those are remote-sensing programs. They will continue to develop technology for those programs which may well have application in the land remote-sensing arena, also.

So I think, as a practical matter, NASA will continue to support remote sensing. I would share your concern that NASA continue to have a role, and I think we are very supportive of NASA continuing to have a role, but I think the chairman is correct. There are governmental interests in additional technology and remote sensing. In meteorology, the Department of Agriculture, for example, is a user with other user agencies which will help drive NASA to do the basic R&D.

Mr. NELSON. What I'm really raising is not so much any question—any technical questions; I'm raising political questions of economics. And if NASA only has so many dollars to operate with and NASA is trying to put together a space station, and so forth, does this not give NASA the legitimate out to say, "OK, here, we're going to turn it over to a commercial enterprise and let them do it. Now that may ultimately be OK, but I just wait to raise the question and get it out here on the table: Is that in the best interest?

I can see those financial pressures building within NASA that say, "OK, now we've got it out here in the commercial sector. Therefore, we don't have to, in our x number of billions of dollars of request to the Congress, include an item for R&D in remote sensing." And I want to constantly keep that question before us, Mr. Chairman, as we go through these deliberations.

Thank you.

Mr. ANDREWS. Mr. Chairman, may I ask one more question?

Mr. SCHEUER. We have Congressman Brooks here, so we don't want to prolong this particularly, but please go ahead.

Mr. ANDREWS. Thank you.

The bill allows a company to build a sensor and launch it on a Government satellite. Since it's so much cheaper to build a sensor as opposed to an entire satellite system, does this provision in the bill, as it's presently drafted, put Space America at a disadvantage?

Mr. SLAYTON. I don't know. Do you want to answer that?

Ms. JOSEPHSON. Yes; you're right in your analysis. You know, it is, obviously, the most expensive combination is the launch and the satellites tend to be more expensive than the sensors. So that is a concern to us.

We have been looking at that section and thinking about it. The bill does say that the Government cannot enter into consortia in competition with private industry, but how that would be interpreted. is very difficult for us to determine. I think we're still unresolved in our own mind exactly what the implications of that section would be. Clearly——

Mr. ANDREWS. You don't know whether it hurts or it helps?

Mr. SLAYTON. That's true.

Ms. JOSEPHSON. Well, it's the implication of that section in how we read it. If, for example, we had a system up there and, therefore, there could be no Government consortium to provide land remote-sensing data because we were already doing it commercially, then we would be protected. If, on the other hand, it was a consortium to provide data which is slightly different and, therefore, the consortium says it's not in direct competition with us, then suddenly we end up with a difficult situation.

And I think maybe what we need to do is think about the language some more, and refine it that, and we will submit our comments.

Mr. ANDREWS. Thank you.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Slayton follows:]

STATEMENT OF

DONALD K. (DEKE) SLAYTON

PRESIDENT, SPACE SERVICES INC. OF AMERICA

ON BEHALF OF

SPACE AMERICA

BEFORE THE SUBCOMMITTEE ON NATURAL RESOURCES,

AGRICULTURAL RESEARCH AND THE ENVIRONMENT

AND THE

SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS

COMMITTEE ON SCIENCE AND TECHNOLOGY

NOVEMBER 9, 1983

CHAIRMAN SCHEUER, CHAIRMAN VOLKMER, MEMBERS OF THE SUBCOMMITTEE: THANK YOU FOR YOUR KIND INVITATION TO PRESENT TESTIMONY. I AM DEKE SLAYTON, PRESIDENT OF SPACE SERVICES INC. SSI ENTERED INTO A JOINT VENTURE EFFECTIVE JUNE 1, 1983, WITH THE AMERICAN SCIENCE AND TECHNOLOGY CORPORATION (AS&T) AND THE AEROS DATA COPORATION (AEROS), UNDER THE NAME "SPACE AMERICA." ACCOMPANYING ME TODAY IS DIANA H. JOSEPHSON, PRESIDENT OF AS&T AND OF SPACE AMERICA.

AS&T WAS FORMED IN 1981 TO DEVELOP A PRIVATE SECTOR EARTH RESOURCES SATELLITE PROGRAM AS A FOLLOW-ON TO LANDSAT D', AFTER THE GOVERNMENT'S DECISION TO DISCONTINUE THE LANDSAT PROGRAM. AEROS WAS FORMED IN 1982 TO PROVIDE VALUE-ADDED PROCESSING OF RAW DATA FROM LANDSAT AND ANY OTHER REMOTE SENSING SPACECRAFT, AIRCRAFT DATA, AND CONVENTIONAL DATA. SSI WAS FORMED IN 1980 TO DEVELOP A NEW GENERATION OF LOW-COST, EXPENDABLE LAUNCH VEHICLES AND OTHER LOW-COST SPACE SYSTEMS.

THE SPACE AMERICA PROGRAM IS DESIGNED TO PROVIDE THE FIRST COMMERCIAL U. S. LAND REMOTE SENSING SATELLITE SYSTEM USING LOW-COST "STATE-OF-THE-ART" SPACECRAFT, SENSORS, AND COMPUTER TECHNOLOGY. SPACE AMERICA'S SPACE SYSTEM WILL PROVIDE 80 AND 40 METER STEREOSCOPIC IMAGERY IN EIGHT VISIBLE BANDS, USING SOLID STATE SENSORS. THE MORE ADVANCED TECHNOLOGY OF CHARGE COUPLED DEVICES (CCDs), USED AS DETECTORS IN THESE SENSORS, ELIMINATES THE USE OF THE MOVABLE SCANNING MIRRORS USED IN THE LANDSAT SYSTEM'S MULTI-SPECTRAL SCANNER AND THEMATIC MAPPER SENSORS. THE CCDs SUBSTANTIALLY REDUCE THE SIZE OF THE SENSORS, AND ENABLE A SMALLER, LIGHTER SPACECRAFT TO BE USED. THE SMALLER SIZE OF THE SPACE SEGMENT RESULTS IN DRAMATIC COST REDUCTIONS FROM THE $300 MILLION PRICE TAG OF A LANDSAT SATELLITE TO A $30 MILLION PRICE TAG FOR A SPACE AMERICA SATELLITE. A DETAILED COMPARISON OF THE SPACE AMERICA AND LANDSAT SYSTEMS IS ATTACHED.

BALL AEROSPACE SYSTEMS DIVISION IS THE SPACECRAFT BUS CONTRACTOR AND HONEYWELL'S ELECTRO-OPTICS DIVISION WILL BUILD THE SENSORS. THEIR

PARTICIPATION HAS CONFIRMED OUR BELIEF THAT WE HAVE A TECHNICALLY CREDIBLE, COST-EFFECTIVE SYSTEM. SPACE AMERICA IS ACTIVELY NEGOTIATING WITH OTHER POTENTIAL MEMBERS OF ITS INDUSTRY TEAM AND PLANS TO MAKE AN ANNOUNCEMENT SHORTLY.

THE SPACE AMERICA SPACECRAFT IS COMPATIBLE WITH BOTH THE SHUTTLE AND THE CONESTOGA II LAUNCH VEHICLE DEVELOPED BY SSI. WE WILL, HOWEVER, USE THE SHUTTLE IF IT PROVES TIMELY AND LESS EXPENSIVE THAN A CONESTOGA LAUNCH. MODELS OF OUR OWN LAUNCH VEHICLE AS WELL AS OUR SENSOR AND SPACECRAFT ARE ON DISPLAY. THE SENSOR IS LIFE-SIZE.

IN ADDITION TO ITS SPACE SEGMENT, SPACE AMERICA IS DEVELOPING A NEXT-GENERATION DATA PROCESSING SOFTWARE SYSTEM, THE COMBINED ENVIRONMENTAL/ECONOMIC DATA AND INFORMATION SYSTEM (CEDIS). CEDIS WILL COMBINE SATELLITE, AIRCRAFT AND CONVENTIONAL DATA AND WILL PRODUCE ADVANCED INFORMATION PRODUCTS FOR USERS WORLDWIDE. IT WILL TAKE ADVANTAGE OF THE ADVANCES IN COMPUTER AND OTHER TECHNOLOGIES THAT ARE OCCURRING WITH INCREASING RAPIDITY.

THE SPACE AMERICA PROGRAM IS DESIGNED TO MEET THE DEMANDS OF DATA USERS WORLDWIDE, SUCH AS THE FEDERAL AGENCIES, U. S. INDUSTRY, THE ACADEMIC COMMUNITY, FOREIGN GROUND STATIONS, FOREIGN GOVERNMENTS AND INDUSTRY, AND THE INTERNATIONAL COMMUNITY. IT IS DESIGNED TO EXPAND THE EXISTING MARKETS BY PROVIDING STEREOSCOPIC DATA IN NEAR-REAL TIME AND AT PRICES WHICH WILL ENABLE MANY ADDITIONAL CUSTOMERS TO USE THESE DATA WORLDWIDE, AS WELL AS THE CEDIS PRODUCTS. OUR MARKET SURVEYS HAVE CONVINCED US THAT THERE IS A LARGE AND GROWING MARKET FOR BOTH RAW DATA AND NEXT GENERATION INFORMATION/PLANNING PRODUCTS.

WE FIRMLY BELIEVE THAT A COMMERCIAL LAND REMOTE SENSING INDUSTRY WILL ATTRACT THE NECESSARY PRIVATE FINANCING. CONSEQUENTLY, WE ARE PURSUING ALL POSSIBLE OPTIONS TO EXPAND THE MARKET FOR LAND REMOTE SENSING DATA AND INFORMATION PRODUCTS.

WE BELIEVE THAT THE SPACE AMERICA APPROACH OF LOW-COST, MARKET-

ORIENTED REMOTE SENSING SYSTEMS WILL BECOME A REALITY WITH YOUR HELP. THE CONGRESS WILL HAVE A MAJOR IMPACT ON OUR FUTURE, AS IT HAS ON OUR EFFORTS TO DATE. LAST SPRING, IMMEDIATELY PRECEDING THE ADMINISTRATION'S ANNOUNCEMENT OF ITS INTENTION TO COMMERCIALIZE BOTH THE LAND REMOTE SENSING AND WEATHER SATELLITES, SSI INITIATED A STOCK-OFFERING FOR THE SPACE AMERICA PROGRAM. A MISUNDERSTANDING OF HIGHLY PUBLICIZED OPPOSITION TO THE COMMERCIALIZATION OF THE WEATHER SATELLITES, AND CONSEQUENT UNCERTAINTY OVER THE STATUS OF GOVERNMENT EFFORTS TO COMMERCIALIZE LAND REMOTE SENSING, PLAYED A MAJOR ROLE IN MINIMIZING THE SUCCESS OF OUR INVESTMENT EFFORTS. WE ARE, THEREFORE, EXTREMELY PLEASED TO HAVE THE OPPORTUNITY TO CLARIFY THE RECORD THROUGH THIS HEARING ON LEGISLATION THAT WILL ENCOURAGE THE DEVELOPMENT OF A U. S. LAND REMOTE SENSING SATELLITE INDUSTRY.

WE APPLAUD THIS COMMITTEE FOR TAKING THE LEAD IN DEMONSTRATING GOVERNMENT SUPPORT FOR COMMERCIAL LAND REMOTE SENSING VENTURES, AND WE SUPPORT YOUR BILL AND THE "TRANSITIONAL APPROACH" IT PROMOTES. WE HAVE BEEN INVITED TO ADDRESS SPECIFIC SECTIONS OF THE DRAFT BILL, "LAND REMOTE SENSING COMMERCIALIZATION ACT OF 1983".

WE HAVE REVIEWED THE BILL'S DEFINITION OF THE GOVERNMENT'S BASELINE DATA REQUIREMENT CONTAINED IN SECTION 301 AND HAVE CONCLUDED THAT OUR SYSTEM QUALIFIES UNDER SUBSECTION (B). OUR SENSOR USES A MUCH NEWER TECHNOLOGY THAN THE MSS SENSOR AND WE PLAN TO CARRY A COMBINATION OF MSS, TM, AND COASTAL ZONE COLOR SCANNER BANDS AT 80- AND 40-METER SPATIAL RESOLUTION, WHICH WILL DELIVER DATA TO THE USERS THAT ARE "FUNCTIONALLY EQUIVALENT TO DATA FROM THE MULTI-SPECTRAL SCANNER" AND "FULLY COMPATIBLE WITH DATA, AND EQUIPMENT USED TO PROCESS DATA, FROM SUCH SCANNER". WE SUPPORT SECTION 302, WHICH REQUIRES DATA OF MSS QUALITY, AS DEFINED IN SECTION 301, BUT ALLOWS THE "CONTRACTOR" TO MAKE AVAILABLE DATA OF A HIGHER QUALITY. AS I HAVE MENTIONED PREVIOUSLY, THE SPACE AMERICA SYSTEM IS MARKET-ORIENTED; BAND AND RESOLUTION IMPROVEMENTS WILL BE ONGOING AS WE DEVELOP OUR SECOND AND THRID SATELLITES. ANY

BUSINESS MUST CONSTANTLY UPGRADE ITS PRODUCTS TO REMAIN COMPETITIVE. OUR CURRENT SCHEDULE CALLS FOR OUR FIRST LAUNCH TWO YEARS AFTER WE OBTAIN FCC TRANSMISSION LICENSES, AND OTHER GOVERNMENT APPROVALS. YOU SHOULD KNOW THAT WE ORIGINALLY PLANNED TO TRANSMIT IN S-BAND (THE MSS FREQUENCY) BUT THESE PLANS WERE ADJUSTED FOR X-BAND (THE TM FREQUENCY) WHEN WE WERE INFORMED via RFP THAT THE GOVERNMENT DOES NOT PLAN TO MAKE THE S-BAND FREQUENCY AVAILABLE AFTER D'. WE WILL HOWEVER TRANSMIT AT 18 MEGABITS PER SECOND RATHER THAN THE TM RATE OF 85 MEGABITS PER SECOND SO THAT THE DATA PROCESSING TIME, COST AND EQUIPMENT ARE THE SAME AS FOR THE MSS DATA. THIS ADJUSTMENT IS JUST ONE OF THE MANY CHANGES WE HAVE MADE AS WE HAVE DEVELOPE THE FIRST PRIVATE SECTOR LAND REMOTE SENSING SYSTEM. THE FEDERAL AGENCIES HAVE BEEN EXTREMELY HELPFUL DURING THIS PROCESS, BUT THE LACK OF CLEAR POLICY GUIDELINES ON THE LANDSAT ISSUE HAS LED TO DELAY AND CONFUSION. WE HOPE YOUR LEGISLATION WILL IMPROVE OUR SITUATION.

WE BELIEVE THAT THE CRITERIA IN SECTION 203 FOR EVALUATION OF BIDS ARE ADEQUATE AND FAIR. WE WOULD, HOWEVER, LIST "CONTINUITY OF DATA" AS A SEPARATE CRITERION; AND IF THE CRITERIA ARE IN ORDER OF PRIORITY, WE WOULD PUT THAT ONE FIRST. IT IS OUR VIEW THAT DATA CONTINUITY IS THE MOST IMPORTANT ASPECT OF THE LANDSAT COMMERCIALIZATION ISSUE. ONLY WITH THE ASSURANCE OF DATA CONTINUITY WILL THERE BE THE CONFIDENCE NECESSARY TO JUSTIFY USER INVESTMENTS IN DATA RECEIPT AND USE. THE CERTAINTY OF A FUTURE U. S. LAND REMOTE SENSING CAPABILITY WILL ENABLE THE MARKETERS OF RAW DATA AND OF VALUE-ADDED PRODUCTS TO COMPETE WITH SUBSIDIZED FOREIGN COMPETITORS. NASA DEVELOPED THE WORLD'S FIRST LAND REMOTE SENSING SYSTEM, LANDSAT, USING TAXPAYER MONIES AND WE BELIEVE THOSE TAXPAYERS SHOULD BENEFIT FROM THEIR INVESTMENT THROUGH THE DEVELOPMENT OF A NEW U. S. INDUSTRY. ONCE AGAIN, FOREIGN GROUPS ARE EXPLOITING A U. S. DEVELOPED TECHNOLOGY. WE CANNOT AFFORD TO LOSE THIS NEW INDUSTRY TO SUBSIDIZED FOREIGN COMPETITION.

WE HAVE NOTED THAT THE SELECTION CRITERIA SET FORTH IN YOUR BILL

DIFFER FROM THOSE LISTED IN THE DRAFT RFP TO COMMERCIALIZE THE LANDSAT SYSTEM. IT WOULD BE HELPFUL IF THE RFP AND ANY LEGISLATION WERE CONSISTENT SO THAT AN INDUSTRY BID WOULD BE EVALUATED UNDER SIMILAR CRITERIA BY BOTH THE ADMINISTRATION AND THE CONGRESS. WE ARE ASSUMING THAT THE FINAL RFP WILL NOT EXCLUDE OUR TYPE OF APPROACH FOR TRANSITIONING FROM THE GOVERNMENT TO PRIVATE SECTOR SYSTEMS. HOWEVER, UNCERTAINTY SURROUNDING THE RFP PROCESS AND ITS RELATIONSHIP TO THE LEGISLATIVE PROCESS ARE OF MAJOR CONCERN TO THOSE OF US INTENDING TO BID ON THE FINAL RFP. WE HOPE THE DEPARTMENT OF COMMERCE AND THE CONGRESS ARE COORDINATING THEIR EFFORTS SO THAT THE TWO PROCESSES DOVETAIL SOMETIME NEXT SESSION --- OR SOONER.

SSI, AS&T AND AEROS HAVE EXPENDED SUBSTANTIAL RESOURCES ON DEVELOPMENT OF A PRIVATE LAND REMOTE SENSING SYSTEM. WE WOULD LIKE TO SEE OUR EFFORTS TO PROVIDE A SPACE SYSTEM FOR ONE-TENTH THE COST OF LANDSAT COME TO FRUITION.

OUR DETAILED BUT MINOR COMMENTS ON YOUR DRAFT BILL ARE CONTAINED IN OUR WRITTEN SUBMISSION. DIANA JOSEPHSON AND I WELCOME ANY QUESTIONS YOU OR YOUR STAFF MAY HAVE.

ATTACHMENT

Attachment

COMPARISON OF SPACE AMERICA AND LANDSAT

	SPA	LANDSAT
INSTRUMENTS	Two Sensors 8 Bands 6 Bands at 80-meter Resolution; 2 Bands at 40-meter Resolution	Two Sensors 11 Bands 4 Bands at 80-meter Resolution; 7 Bands at 30-meter Resolution
	Stereoscopic Coverage	No Stereoscopic Coverage
	Solid State, Charge-Coupled Device Sensor--No Moving Parts	Optical Scanning Mirror Sensor--Moving Parts
	320 km Swath Width	185 km Swath Width
MISSION LIFE	5 Years	3 Years
PROJECTED COST	$30 Million	$300 Million
CONSTRUCTION SCHEDULE	2 Years	4 Years
LAUNCH VEHICLE	STS or Conestoga II	STS or Delta 39-20
PROJECTED LAUNCH COSTS	$10-$15 Million	$35-$75 Million
COMPATIBLE WITH EXISTING GROUND STATIONS	Yes (Requires X-Band Upgrade)	Yes (Requires X-Band Upgrade)
DATA TRANSMISSION	X-Band at 18 Megabits per Second	S-Band at 15 Megabits per Second X-Band at 85 Megabits per Second
INDUSTRIAL TEAM	Space America, Ball Aerospace, Honeywell	General Electric, Hughes, Fairchild Space Company
REPEAT CYCLE	18 Day; Adjacent Swaths	16 Day; Skipped Swaths

POSSIBLE ADDITIONS TO SPA

- Third sensor providing SWIR Shortwave infrared, TM-type data, 1.5 and 2.2 micron bands. Space America would use new focal plane arrays under development by NASA.

- Next generation 20 MPS tape recorder with 5-year life, also under development by NASA.

* SPA IS DESIGNED TO MEET CURRENT MARKET DEMAND; ADDITIONS WILL BE BASED ON DEMAND.

sPA

SENSOR BANDS AND RESOLUTION

BAND 1.1	0.45 to 0.52 microns	80 meters	TM
BAND 1.2	0.52 to 0.60 microns	80 meters	TM
BAND 1.3	0.63 to 0.69 microns	40 meters	TM
BAND 1.4	0.76 to 0.90 microns	80 meters	TM
BAND 2.1	0.433 to 0.453 microns	80 meters	CZCS
BAND 2.2	0.54 to 0.56 microns	80 meters	CZCS
BAND 2.3	0.6 to 0.7 microns	40 meters	MSS and CZCS
BAND 2.4	0.7 to 0.8 microns	80 meters	MSS

LANDSAT

SENSOR BANDS AND RESOLUTION

BAND 1.1	0.5 to 0.6 microns	80 meters	MSS
BAND 1.2	0.6 to 0.7 microns	80 meters	MSS
BAND 1.3	0.7 to 0.8 microns	80 meters	MSS
BAND 1.4	0.8 to 1.1 microns	80 meters	MSS
BAND 2.1	0.45 to 0.52 microns	30 meters	TM
BAND 2.2	0.52 to 0.60 microns	30 meters	TM
BAND 2.3	0.63 to 0.69 microns	30 meters	TM
BAND 2.4	0.76 to 0.90 microns	30 meters	TM
BAND 2.5	1.55 to 1.75 microns	30 meters	TM
BAND 2.6	10.4 to 12.5 microns	120 meters	TM
BAND 2.7	2.08 to 2.35 microns	30 meters	TM

Mr. SCHEUER. Well, I wish to thank the panel for very thoughtful and very stimulating testimony. You probably will be getting some additional questions for us in the next week or 10 days. We thank you very much for your fine testimony.

Mr. SLAYTON. Thank you, Mr. Chairman.

Mr. SCHEUER. All right. We now have the chairman of the Government Operations Committee here, the Honorable Jack Brooks of Texas, who has finished his deliberations with the Senate conferees and the House conferees.

And I take it you've achieved some kind of resolution on this perplexing matter of the continuing resolution and that's all neatly tucked away? You don't have to tell us about it.

OK. Congressman, we're delighted to have you here. You're a key player in this whole business of making America first in space again.

Please proceed as you wish.

STATEMENT OF HON. JACK BROOKS, A MEMBER OF CONGRESS FROM THE STATE OF TEXAS

Mr. BROOKS. I want to thank you very much, Mr. Chairman and gentlemen, for the opportunity to testify before these subcommittees jointly on the urgent matter of how to save our Nation's land remote-sensing satellite program, known as Landsat.

As you know, I've been closely following the administration's efforts to commercialize our Government's weather and land remote-sensing satellites for some time. For a variety of different reasons, I have been a vocal opponent of this effort. I commend you and your committees, subcommittees, for having this hearing—so we can have a little time to waste—because we've got very little time to waste if we're going to save, salvage, the pieces of our Nation's Landsat program.

This administration took an enormous chance 3 years ago when it decided not to fund the construction of any more Landsat satellites, apparently banking on being able to rid itself of the responsibility for the program before another follow-on satellite would be needed. Unfortunately for all of us, the administration gambled and lost.

With the premature failure of Landsat 4, the entire program has been thrown off schedule, and we are now anticipating substantial gaps in data transmissions. Coupled with the administration's premature effort to commercialize Landsat, we must now confront the very real possibility that the program has been irreparably damaged.

I'm pleased to see that there are a number of us in Congress who are not willing to sit idle and observe the demise of the Landsat program. We know that we may not be able to get the program back on its feet as if nothing had happened, but we're willing to do whatever is necessary to minimize the disaster.

Your bill, entitled "The Land Remote-Sensing Commercialization Act of 1983," the subject of today's hearing, is one example of how to deal with this situation. My bill entitled, "The Land Remote-Sensing Satellite Authorization Act of 1983," which is also pending in this committee, is another example.

There are two basic differences between our approaches to this matter.

First, mine returns Landsat to NASA where it was housed up until a few weeks before the current commercialization effort began.

Second, mine requires the Government to maintain an active role in the operations of a Landsat program rather than favoring complete commercialization of the program. This latter position in my bill, however, in no way forecloses the commercialization of large parts of the program.

The return of Landsat to NASA is logical in view of its greater experience with the program, but is probably not crucial to the survival. The need to retain active Government involvement in the operation of the Landsat program is, in my opinion, very important.

Six weeks ago the Committee on Government Operations' Subcommittee on Legislation and National Security, which I chair, held hearings on the international implications of the commercialization of Landsat. In listening to the testimony presented at these hearings, it quickly became apparent that the Landsat program has been a significant maker of international friends for the United States. During the past decade, the United States has helped over 40 developing nations gain vital information about their lands and their survival. If the Landsat program is completely commercialized, I'm deeply concerned that our Nation may lose this valuable foreign aid tool.

In addition, many foreign nations have seen the value of Landsat data and have invested considerable resources in building and operating Landsat ground stations around the world, to the benefit of the United States as well as other foreign nations. Virtually all of these nations have expressed concern over the possible adverse effects of commercializing Landsat and several have expressed grave reservations about continuing a cooperative land remote-sensing venture with any U.S. entity other than the Government. Thus, active involvement of the U.S. Government may be essential to the successful continuation of the Landsat program.

Finally, much of my concern over the commercialization of Landsat has to do with its impact on our national security. GAO is currently preparing a detailed report on this matter for my subcommittee. And as soon as the report is finished, I'll be more than happy to make it available to your subcommittees.

Much of the GAO information is classified, but preliminary indications are that when one evaluates DOD's proposed future uses of Landsat data, one could speculate that future military operations could be degraded by an interruption of future Landsat products. To insure that such interruptions do not occur and that other actions are not taken that may adversely affect defense matters, I think it is important and vital that the U.S. Government maintain an active role in the operations of any Landsat program.

Thank you very much.

[The prepared statement of Hon. Jack Brooks follows:]

Statement of Congressman Jack Brooks
Before the Subcommittees on Natural Resources, Agriculture Research
and Environment, and Space Science and Applications
Joint Hearing on the LANDSAT Program
Wednesday, November 9, 1983

MR. CHAIRMAN, THANK YOU FOR THE OPPORTUNITY TO TESTIFY BEFORE THESE SUBCOMMITTEES ON THE URGENT MATTER OF HOW TO SAVE OUR NATION'S LAND REMOTE SENSING SATELLITE PROGRAM, KNOWN AS LANDSAT. AS YOU KNOW, I HAVE BEEN CLOSELY FOLLOWING THE ADMINISTRATION'S EFFORTS TO COMMERCIALIZE OUR GOVERNMENT'S WEATHER AND LAND REMOTE SENSING SATELLITES FOR SOME TIME. FOR A VARIETY OF DIFFERENT REASONS, I HAVE BEEN A VOCAL OPPONENT OF THIS EFFORT. I COMMEND YOU AND YOUR SUBCOMMITTEE FOR HOLDING THESE HEARINGS AS WE HAVE LITTLE TIME TO WASTE IF WE ARE TO SALVAGE THE PIECES OF OUR NATION'S LANDSAT PROGRAM.

THIS ADMINISTRATION TOOK AN ENORMOUS CHANCE THREE YEARS AGO WHEN IT DECIDED NOT TO FUND THE CONSTRUCTION OF ANY MORE LANDSAT SATELLITES, APPARENTLY BANKING ON ITS BEING ABLE TO RID ITSELF OF THE RESPONSIBILITY FOR THE PROGRAM BEFORE ANOTHER FOLLOW-ON SATELLITE WOULD BE NEEDED. UNFORTUNATELY FOR ALL OF US, THE ADMINISTRATION GAMBLED AND LOST. WITH THE PREMATURE FAILURE OF LANDSAT 4, THE ENTIRE PROGRAM HAS BEEN THROWN OFF SCHEDULE AND WE ARE NOW ANTICIPATING SUBSTANTIAL GAPS IN DATA TRANSMISSIONS. COUPLED WITH THE ADMINISTRATION'S PREMATURE EFFORT TO COMMERCIALIZE LANDSAT, WE MUST NOW CONFRONT THE VERY REAL POSSIBIILTY THAT THIS PROGRAM HAS BEEN IRREPARABLY DAMAGED.

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I AM PLEASED TO SEE THAT THERE ARE A NUMBER OF US IN CONGRESS WHO ARE NOT WILLING TO SIT IDLE AND OBSERVE THE DEMISE OF THE LANDSAT PROGRAM. WE KNOW THAT WE MAY NOT BE ABLE TO GET THE PROGRAM BACK ON ITS FEET AS IF NOTHING HAD HAPPENED, BUT WE'RE WILLING TO DO WHATEVER IS NECESSARY TO MINIMIZE THE DISASTER. YOUR BILL, ENTITLED THE "LAND REMOTE SENSING COMMERCIALIZATION ACT OF 1983," WHICH IS THE SUBJECT OF TODAY'S HEARING, IS ONE EXAMPLE OF HOW TO DEAL WITH THIS SITUATION. MY BILL ENTITLED THE "LAND REMOTE SENSING SATELLITE AUTHORIZATION ACT OF 1983," WHICH IS ALSO PENDING IN THIS COMMITTEE, IS ANOTHER EXAMPLE.

THERE ARE TWO BASIC DIFFERENCES BETWEEN OUR APPROACHES TO THIS MATTER. FIRST, MINE RETURNS THE LANDSAT PROGRAM TO NASA WHERE IT WAS HOUSED UP UNTIL A FEW WEEKS BEFORE THE CURRENT COMMERCIALIZATION EFFORT BEGAN. SECOND, MINE REQUIRES THE GOVERNMENT TO MAINTAIN AN ACTIVE ROLE IN THE OPERATIONS OF A LANDSAT PROGRAM RATHER THAN FAVORING COMPLETE COMMERCIALIZATION OF THE PROGRAM. THIS LATTER POSITION IN MY BILL, HOWEVER, IN NO WAY FORECLOSES THE COMMERCIALIZATION OF LARGE PARTS OF THE PROGRAM.

THE RETURN OF LANDSAT TO NASA IS LOGICAL IN VIEW OF ITS GREATER EXPERIENCE WITH THIS PROGRAM, BUT IS PROBABLY NOT CRUCIAL TO THE SURVIVAL ~~OF THE PROGRAM.~~ THE NEED TO RETAIN ACTIVE GOVERNMENT INVOLVEMENT IN THE OPERATION OF THE LANDSAT PROGRAM IS, IN MY OPINION, VERY IMPORTANT.

3 3 3 3 3

SIX WEEKS AGO, THE COMMITTEE ON GOVERNMENT OPERATIONS' SUBCOMMITTEE ON LEGISLATION AND NATIONAL SECURITY, WHICH I CHAIR, HELD HEARINGS ON THE INTERNATIONAL IMPLICATIONS OF THE COMMERCIALIZATION OF LANDSAT. IN LISTENING TO THE TESTIMONY PRESENTED AT THESE HEARINGS, IT QUICKLY BECAME APPARENT THAT THE LANDSAT PROGRAM HAS BEEN A SIGNIFICANT MAKER OF INTERNATIONAL FRIENDS FOR THE UNITED STATES. DURING THE PAST DECADE, THE U.S. HAS HELPED OVER 40 DEVELOPING NATIONS GAIN VITAL INFORMATION ABOUT THEIR LAND. IF THE LANDSAT PROGRAM IS COMPLETELY COMMERCIALIZED, I AM DEEPLY CONCERNED THAT OUR NATION MAY LOSE THIS VALUABLE FOREIGN AID TOOL.

IN ADDITION, MANY FOREIGN NATIONS HAVE SEEN THE VALUE OF LANDSAT DATA AND HAVE INVESTED CONSIDERABLE RESOURCES IN BUILDING AND OPERATING LANDSAT GROUND STATIONS AROUND THE WORLD, TO THE BENEFIT OF THE UNITED STATES AS WELL AS OTHER FOREIGN NATIONS. VIRTUALLY ALL OF THESE NATIONS HAVE EXPRESSED CONCERN OVER THE POSSIBLE ADVERSE EFFECTS OF COMMERCIALIZING LANDSAT AND SEVERAL HAVE EXPRESSED GRAVE RESERVATIONS ABOUT CONTINUING A COOPERATIVE LAND REMOTE SENSING VENTURE WITH ANY U.S. ENTITY OTHER THAN THE GOVERNMENT. THUS, ACTIVE INVOLVEMENT OF THE U.S. GOVERNMENT MAY BE ESSENTIAL TO THE SUCCESSFUL CONTINUATION OF THE LANDSAT PROGRAM.

FINALLY, MUCH OF MY CONCERN OVER THE COMMERCIALIZATION OF LANDSAT HAS TO DO WITH ITS IMPACT ON OUR NATION'S SECURITY. GAO IS CURRENTLY PREPARING A DETAILED REPORT ON THIS MATTER FOR MY SUBCOMMITTEE. AS SOON AS THE REPORT IS FINISHED, I WILL BE ~~MOST~~ more than HAPPY TO SHARE IT WITH YOU.

MUCH OF THE GAO INFORMATION IS CLASSIFIED, BUT PRELIMINARY INDICATIONS ARE THAT WHEN ONE EVALUATES DOD'S PROPOSED FUTURE USES OF LANDSAT DATA, ONE COULD SPECULATE THAT FUTURE MILITARY OPERATIONS COULD BE DEGRADED BY AN INTERRUPTION OF FUTURE LANDSAT PRODUCTS. TO ENSURE THAT SUCH INTERRUPTIONS DO NOT OCCUR AND THAT OTHER ACTIONS ARE NOT TAKEN THAT MAY ADVERSELY AFFECT DEFENSE MATTERS, I THINK IT IS IMPORTANT vital THAT THE U.S. GOVERNMENT MAINTAIN AN ACTIVE ROLE IN THE OPERATIONS OF ANY LANDSAT PROGRAM.

THANK YOU.

# # #

98TH CONGRESS
1ST SESSION

H. R. 4030

To authorize the continuation of the land remote sensing satellite program (Landsat), and to ensure the United States role as the world leader in developing and utilizing land remote sensing space technology through the Landsat program.

IN THE HOUSE OF REPRESENTATIVES

SEPTEMBER 29, 1983

Mr. BROOKS (for himself, Mr. HORTON, Mr. WRIGHT, and Mr. BROWN of California) introduced the following bill; which was referred to the Committee on Science and Technology

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A BILL

To authorize the continuation of the land remote sensing satellite program (Landsat), and to ensure the United States role as the world leader in developing and utilizing land remote sensing space technology through the Landsat program.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Land Remote Sensing Satellite Authorization Act of 1983".

FINDINGS, PURPOSES, AND POLICY

SEC. 2. (a) FINDINGS.—The Congress finds and declares that—

(1) for the past decade the United States has been the undisputed leader in land remote sensing space technology;

(2) during that decade the United States land remote sensing program, known as Landsat, has been found to be valuable in agriculture, hydrology, geology, land use planning, environmental monitoring, and surveying ocean resources in the United States and throughout the world;

(3) many foreign nations have seen the value of Landsat data and have invested considerable resources in building and operating eleven Landsat ground stations around the world to the benefit of the United States as well as other foreign nations;

(4) Landsat imagery has proven to be a valuable foreign aid tool and has been used by over forty developing nations to gain vital information about their land, resources and people;

(5) continuous, nondiscriminatory provision of Landsat data is essential for all user nations; and

(6) the premature failure of the present Landsat satellite and ~~the~~ decision to build no further following-on satellites jeopardize the integrity of the entire Landsat system as well as the leadership position of the United States in land remote sensing from space.

(b) PURPOSES.—It is the purpose of this Act—

(1) to maintain the United States leadership position in land remote sensing space technology;

(2) to assure the continuity of the Landsat program; and

(3) to fully honor the United States commitments and obligations to foreign users of Landsat.

(c) POLICY.—It is therefore the policy of the United States that—

(1) the United States should take immediate steps to assure the continuation of the Landsat program; and

(2) the United States should assure all users of Landsat, present and future, that there will be continual transmittal of data and that such data will be distributed in a nondiscriminatory fashion.

AUTHORIZATION OF LAND REMOTE SENSING SATELLITE

SEC. 3. Section 203 of the National Aeronautics and Space Act of 1958 (42 U.S.C. 2473) is amended by adding the following new subsection at the end thereof:

"(d) The Administration is authorized and directed to plan and provide for the development, management, and operation of a civil land-remote sensing satellite system utilizing and advancing the developments in land remote sensing technology."

AUTHORIZATION OF APPROPRIATIONS

SEC. 4. There is authorized to be appropriated such sums as may be necessary to carry out the provisions of section 203(d) of the National Aeronautics and Space Act of 1958 as amended by section 3 of this Act.

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Mr. SCHEUER. Well, thank you very much, Mr. Chairman. We appreciate your testimony.

We understand that you have other commitments and that you must leave now.

Can I simply ask you, before you leave, when the report that you mentioned that your committee's about to complete will be available?

Mr. BROOKS. It's scheduled to be completed about the 31st of January. And as soon as we can get it, we'll shortly ship it over here to you all to take a look, because it benefits your handling this legislation, and we're interested in results and the continuation of this program on a sound basis.

I might add that I talked to the panel just before you, and I don't believe that basically we had any conflict. They want to make a bid on the hardware and maybe bid on operations. Well, let them bid. We'd be delighted to have them build it for one-tenth, as they say, of the cost now. If NASA runs it and they should decide they wanted somebody to operate part of it, or they want to lease a part of the unused capacity, that's an open-ended, logical, businesslike utilization of a Government facility. If we're not using it, certainly we would want to make available some part of that to private industry, provided they paid a fair rental for it. I wouldn't give it to them. They can pay for part of it, particularly if they're going to make a profit out of it.

Mr. SCHEUER. Mr. Chairman, thank you very much for your testimony. We appreciate your coming over here among——

Mr. BROOKS. Thank you. Thank you very much.

Mr. SCHEUER [continuing]. The stress of your responsibilities in the waning days of this 1st session of the 98th Congress. Thank you very much.

We'll now proceed with our last panel: Mr. Charles A. Schmidt, division vice president and general manager of Astro-Electronics, Radio Corp. of America.

Are you accompanied by any of your aides?

STATEMENT OF CHARLES A. SCHMIDT, DIVISION VICE PRESIDENT AND GENERAL MANAGER, ASTRO-ELECTRONICS, RADIO CORP. OF AMERICA

Mr. SCHMIDT. Yes, I have several of my——

Mr. SCHEUER. All right. If you wish any of them to participate, we'll introduce them when the time comes.

Mr. Schmidt, your prepared testimony will be printed in full in the record, so you might want to proceed for 8 or 10 minutes chatting with us informally, hitting the highlights of your testimony, and referring to anything you may have heard this afternoon that you care to comment on.

Please proceed.

Mr. SCHMIDT. Thank you, Mr. Chairman, members of the committee, gentlemen.

It is an honor and privilege to have an opportunity to express my views on the Scheuer/Volkmer bill to this committee.

As vice president and general manager of RCA Astro-Electronics, I have followed the evolution of the question of the commercializa-

tion of Earth remote-sensing and meteorological satellites very carefully. I have a direct interest, not only because of our involvement as a supplier of the space segment for the NOAA/TIROS program, but also because of our position in the commercial satellite market as a major supplier of communications spacecraft.

Our views on the commercialization of the meteorological satellite system have paralleled those expressed in the legislation in question. We, too, see no compelling reason for the commercialization of meteorological satellites, as the issue of public safety and benefit seem better served by leaving the meteorological satellites under the direct control of the Department of Commerce.

More germane to the topic at hand, we see no reason to link the meteorological satellites and the Earth observation satellites in the commercialization initiative. We believe it is not possible to simply commercialize Landsat D or D' by definition without added Federal support to implement a program plan that will produce a space and ground segment designed as an operational system.

It is our position that direct Federal support of the transition is a practical approach to the evolution from R&D to operational status of the Earth remote-sensing system, both for meteorological and Earth remote systems and they should remain independent of each other.

The Landsat system, unlike the Metsat system, is not directly related to the public safety, but it is instrumental in promoting the public welfare. Landsat not only contributes to our ability to maintain a technology leadership role, but demonstrates it to the world, thus enhancing our image and providing us with an asset in our foreign policy inventory which, frankly, is difficult to quantify in dollar-and-cents terms. Now may well be the time to remove Landsat from the experimental R&D domain to the economic realities of commercialization. By that, I mean commercialization would lead to necessary cost reduction steps, such as:

One, the use of a low-cost, in-production spacecraft whose primary design costs are amortized across a large number of similar or evolutionary units. This, incidentally, is a reality in the communications satellite market, and we feel it is a requirement for any successful space enterprise.

The elimination of costly, multiple communication and relay systems in favor of a single command, data receiving and processing site is another very good cost reduction.

And, three, tailoring of the data taken to the market requirements reduces the collection of low-value information and its associated processing costs.

These are feasible cost savings that we have identified as achievements in a transition program, and there is no technical reason why they cannot be accomplished.

Even with such technical operational simplifications and efficiencies, a vigorous marketing campaign will need to be undertaken in order to place Landsat on a sound commercial base.

This marketing campaign will necessarily involve the stimulation of both the value-added industry as well as final end users. We concur with the intent of the legislation to stimulate the value-added industry by encouragement of competition and a finite non-

discriminatory access to the data for existing and potential value-added operations.

We believe that smaller organizations are well suited to participate in the value-added industry because the types of skills required to be successful are not uniquely resident only in large organizations. Also, these skills can be acquired by small business, and the capability to produce a specific land observation product for a specific market can be developed without major capital expense long lead times.

In addition, we envision a successful value-added market as servicing a wide variety of end users comprised of relatively small groups demanding somewhat esoteric processing in order to make the data useful for their needs. This implies that a network of smaller organizations, each tailoring their value-added product to a specific market niche, would be well positioned to service and extend the market. The fact that this would enhance primary data sales would then be of advantage to the spacecraft owner/operator, so it is to his advantage to stimulate this broad participation in the value-added industry. He may choose to participate in the value-added industry, in fact most likely would, so section 202(b) of the legislation is appropriate. It is my position that the constraints of this section are equitable and will provide a sound basis for the development of this business segment.

In any case, the development of this market is the keystone to the development of a commercially viable opportunity, and all this takes time—not months, but years. The recognition in your proposed bill for the need of Government financial support in this venture during the transition phase is equally vital in evolving the operational space hardware.

It is my opinion——

Mr. SCHEUER. Excuse me, Mr. Schmidt. These bells are the second bells in a rollcall vote that we have to get. So I'm going to ask you to suspend, and the committee will recess for 15 minutes while we all answer this rollcall vote.

Mr. SCHMIDT. Thank you.

[Recess.]

Mr. VOLKMER. The two subcommittees will come to order.

We'll proceed with our witnesses. Our next witness is Charles A. Schmidt, division vice president and general manager, Astro-Electronics, RCA.

Do you have someone to accompany you that you want to the table or do you just want to——

Mr. SCHMIDT. I have some people in the back here that, if we need them, we can call them.

Mr. VOLKMER. All right. You've already ended your statement, then, I——

Mr. SCHMIDT. No, I haven't.

Mr. VOLKMER. OK.

Mr. SCHMIDT. The bells got me.

Mr. VOLKMER. OK. Then your statement will be made a part of the record in full. You may either review it in total or summarize it, however you so desire. You may now proceed.

Go ahead.

Mr. SCHMIDT. Thank you.

I'd like to just go back and pick up the beginning of the thought here.

It is my position that the constraints of section 202(b) are equitable and will provide a sound basis for development of this business segment.

In any case, the development of this market is the keystone to the development of a commercially viable opportunity, and all this will take time—not months, but years. The recognition in your proposed bill for the need of Government financial support in this venture during the transition phase is equally vital in evolving the operational space hardware.

It's my opinion that the Landsat system has provided us with a solid basis of Earth remote-sensing technology, by means of the multispectral scanner and the thematic mapper. This technology can now be applied to an efficient commercial Earth sensing system which will lead, after a transition period, to a commercially feasible industry.

Let me comment in more detail on some of the key aspects of this bill and how they relate to our viewpoints on this evolutionary process.

First, we believe that a private sector involvement not only can stimulate and enhance Earth remote sensing, but is also appropriate. Private enterprise has demonstrated repeatedly it is best postured to develop an emerging market by intelligent pursuit of the potential customer base and the economies of technology to address that base.

This is best illustrated by looking back at the commercial communications satellite market, wherein the Government-funded work provided the basis for what has become a flourishing commercial industry. It is important to note the criticality of Government investment as a precursor to a commercial space market.

There could be no commercial Earth observation today were it not for the NASA-funded MSS and TM developments. We firmly support the concept of Government-sponsored R&D and believe it must continue, not only in communications and Earth observations sensors, but also other areas, such as ocean sensing. This may well be the next area to provide us with a commercial opportunity for the application of remote observations from space. NASA R&D over the next few years will be the key to this possibility.

Second, we believe that a federally funded interim period is a requisite required if the transition from Landsat to a commercially operational system is to be successful. Again, this can be best illustrated by analogy to the historical development of commercial communications satellites. NASA-developed technology, starting with Project Score, Echo, and Relay, through the applications technology satellite series, has demonstrated many of the principles and key technology employed in today's geosynchronous communications satellites and will continue, through today's proposed advanced communications technology satellite program, to provide the basis required to nurture and maintain America's leading role in communications technology.

That ATS–6, for example, was a key element in this development is universally agreed. However, ATS–6 bears little resemblance, in detail, to the commercial spacecraft predicated on its technology.

We anticipate the situation will be much more the same between Landsat D and the ultimate operational Earth observation system.

To be specific, present Landsat's are basically R&D spacecraft where development and demonstration of new technology is the principal goal. In comparison, operational systems utilize developed technology and apply improvements through planned implementation where economy is the governing factor. This results in a lower-cost, value-engineered spacecraft, like the TIROS series, which is tailored to suit its operational mission and producible at efficient cost levels. The economies in operational space hardware are extended to its ground segment where management and processing systems are employed to promote effectivity with lower cost.

A comparison of the operational philosophy and costs between the Landsat and TIROS systems illustrates this rather emphatically. The main reason for this is that in the case of an R&D spacecraft routine operations have not yet been established and so more unique situations are encountered, both in spacecraft control and in data processing. The operational system, on the other hand, is more routine in nature and can, therefore, be accommodated by a philosophy which focuses on efficiency and cost reduction.

Third, the concepts of open skies, national security, and international commitments present, in my mind, the most difficult problem in the implementation of a commercial initiative. I assume that national security is the foremost principle in devising the protocol for commercial operation of this system. Therefore, some form of Government control and monitor must be defined and exercised. It is also not crystal clear in my mind, in the review of this bill, if the MSS is the singular device to which nondiscriminatory data access is intended.

My difficulty has origin in title III, and I believe the opportunity for error exists in the title III definitions of multispectral scanner and its data in III(b) (1) and (2). It could be construed that these paragraphs constrain nondiscriminatory access to the data quality and format of the multispectral scanner.

If, on the other hand, this access applies to all instruments that may be part of a Landsat system, then the national security issue becomes more acute since the resolution potential of a thematic mapper and a multispectral linear array, as well as the enhancement of stereo sensing, will generate information whose general access could severely diminish the security of our country.

However, it is still my position that a privately operated remote land-sensing system can be consistent with national security and international commitments while supporting development of a commercial market.

Concerning the national security issues, Government regulations and review procedures can be implemented and imposed on the commercial operator, as suggested in this bill, that could restrict those scenes and/or spectral bands where concerns would be present.

As far as international commitments are concerned, I believe relatively open access to the MSS-type data, which we understand to be the root of our international commitments, does not preclude a viable commercial market development strategy. Again, in this area of Government regulations and policies, they can be made

adequate to control the commercial operator and to insure compliance with international commitments.

Fourth, the open skies policy does not necessarily preclude market development, particularly for the potentially high-value data. A reasonable number of potential high-value users place a higher weight on the timeliness of data, rather than exclusivity. Although, to be sure, at least some of them would prefer exclusivity, it does not appear to be a necessary requirement in a market development strategy.

Long-term archiving of all data taken does not necessarily cause an inconsistency with either the needs of users of timely data or the open skies policy, which insures nondiscriminatory access. It is possible to satisfy both timely, high-value data and nondiscriminatory access through a rule where data is aged before delivery to the archival access. We believe this to be consistent with the open skies policy since the procedure for servicing requests would be nondiscriminatory, consistent, of course, with national security concerns, and all data would ultimately be made available from the archives.

Fifth, it is my position that it is critical to the preeminence of American technology to continue a strong program of technology development in the area of land remote sensors. This continued development of detector technology is not inconsistent with a commercial Earth remote-sensing system, but it is in fact required to insure the viability of such a system.

As a specific example, we believe the multispectral linear array detector technology development, currently being sponsored by both NASA and industry, will be an important element of the next generation Earth remote-sensing system and will be the key advance necessary to expand and maintain a U.S. commercial market in the late eighties and/or early nineties. We encourage the development of these technologies to continue under both commercial and Government auspices in order to provide the industry with the instruments necessary to support the remote-sensing requirements of the future.

Sixth, on the key area of data continuity, I believe that it is possible to insure the continuity of data past Landsat D', provided Landsat D' meets its specified lifetime. I should point out that this will not be a trivial task given the realities of the schedule and programmatic constraints a spacecraft system of this complexity must deal with.

Furthermore, if we are to meet the goal of data continuity reliably, with realistic instrument and spacecraft schedules based on experience and a competent assessment of what is required, it is imperative that the Government move expeditiously.

I believe the authority of the current bill is satisfactory to support the transition system adequately and believe that the presently constituted Source Evaluation Board could be maintained as the most timely approach and authority to implement the dictates of this bill. This body could modify their past work in a manner consistent with this legislation in a relatively straightforward way, resulting in significant time savings compared to starting the entire process again from the beginning. A 6-month delay, for example, would seriously jeopardize the continuity of data after the demise

of Landsat D'; a delay of more than a year would virtually guarantee discontinuity.

It cannot be overemphasized that the key to continuity of data is timeliness of implementation. The current legislative language, specifically the language in section 201 and section 302 of the bill, provides a completely rational implementation approach which is acceptable as a basis for the transition period and future operations.

Finally, on the top of Government oversight, regulation and responsibility for future private operation of land remote-sensing satellite systems, it appears as if the proposed legislation, specifically title IV and title VI, provide a satisfactory framework for the requirements and constraints governing an owner/operator under the proposed legislation.

Mr. Chairman, this concludes my prepared statement, and I wish to thank the committee for the opportunity to express my views, and I will answer any questions that I'm capable of.

[The prepared statement of Mr. Schmidt follows:]

TESTIMONY OF CHARLES A. SCHMIDT, RCA ASTRO-ELECTRONICS

Mr. Chairman, Members of the Committee, Gentlemen: It is an honor and privilege to have an opportunity to express my views on the Scheuer/Volkmer Bill to this committee.

As Vice-President and General Manager of RCA Astro-Electronics, I have followed the evolution of the question of the commercialization of earth remote sensing and meteorological satellites very carefully. I have a direct interest not only because of our involvement as supplier of the space segment of the NOAA/TIROS program, but also because of our position in the commercial satellite market as a major supplier of communications spacecraft. Our views on the commercialization of the meteorological satellite system parallel those expressed in the legislation in question. We too see no compelling reason for the commercialization of meteorological satellites, as the issue of public safety and benefit seem better served by leaving the meteorological satellites under direct control of the Department of Commerce.

More germane to the topic at hand, we see no reason to link the meteorological satellites and the earth observation satellites in the commercialization initiative. We believe it is not possible to simply commercialize Landsat D and/or D', by definition, without added Federal support to implement a program plan that will produce a space and ground segment designed as an operational system. It is our position that direct Federal support of the transition is a practical approach to the evolution from R&D to operational status of the earth remote sensing system. Meteorological and earth remote sensing systems should remain independent of each other.

The Landsat system, unlike the Metsat system, is not directly related to the public safety, but it is instrumental in promoting the public welfare. Landsat not only contributes to our ability to maintain a technology leadership role, but demonstrates it to the world, thus enhancing our image and providing us with an asset in our foreign policy inventory, which frankly is difficult to quantify in dollar and cents terms. Now, may well be the time to remove Landsat from the experimental R&D domain to the economic realities of commercialization. By that, I mean commercialization would lead to necessary cost reduction steps, such as:

1. The use of a low cost, in production spacecraft, whose primary design costs are amortized across a large number of similar or evolutionary units. This, incidentally, is a reality in the communications satellite market and we feel it is a requirement of any successful commercial enterprise.
2. The elimination of costly multiple communication and relay systems in favor of a single command, data receiving and processing site.
3. The tailoring of the data taken to the market requirements, reduces the collection of low value information and its associated processing costs.

These are feasible cost savings that we have identified as achievements in a transition program and there is no technical reason they cannot be accomplished.

Even with such technical operational simplifications, and efficiencies a vigorous marketing campaign will need to be undertaken in order to place Landsat on a sound commercial base.

This marketing campaign will necessarily involve the stimulation of both the value added industry as well as final end users. We concur with the intent of the legislation to stimulate the value added industry by encouragement of competition and a finite nondiscriminatory access to the data for existing and potential value added operations.

We believe that smaller organizations are well suited to participate in the value added industry because the types of skills required to be successful are not uniquely resident in large organizations. Also, these skills can be acquired by small business and the capability to produce a specific land observation product for a specific market can be developed without major capital expense or long lead times. In addition, we envision a successful value added market as servicing a wide variety of end users comprised of relatively small groups demanding somewhat esoteric processing in order to make the data useful for their needs. This implies that a network of smaller organizations, each tailoring their value added product to a specific market niche, would be well positioned to service and extend the market. The fact that this would enhance primary data sales would then be of advantage to the spacecraft owner/operator, so it is to his advantage to stimulate this broad participation in the value added industry. He may choose to participate in the value added industry, in fact most likely would, so section 202.b of the legislation is appropriate. It is my position that the constraints of this section are equitable and will provide a sound basis for the development of this business segment.

In any case, the development of this market is the keystone to the development of a commercially viable opportunity and all this will take time—not months, but years. The recognition in your proposed bill for the need of government financial support in this venture during the transition phase is equally vital in evolving the operational space hardware.

It is my opinion that the Landsat system has provided us with a solid basis of earth remote sensing technology, by means of the Multi-Spectral Scanner [MSS] and Thematic Mapper [TM]. This technology can now be applied to an efficient commercial earth sensing system which will lead, after a transition period, to a commerically feasible industry. Let me comment, in more detail, on some of the key aspects of the bill and how they relate to our viewpoints on this evlutionary process.

First, we believe that a private sector involvement not only can stimulate and enhance earth remote sensing, but is also appropriate. Private enterprise has demonstrated repeatedly it is best postured to develop an emerging market by intelligent pursuit of the potential customer base and the economies of technology to address that base. This is best illustrated by looking back at the commercial communications satellite market, wherein the government funded work provided the basis for what has become a flourishing commercial industry. It is important to note the criticality of government investment as a precursor to a commercial space market. There could be no commercial earth observation today were it not for the NASA funded MSS and TM developments. We firmly support the concept of government sponsored R&D and believe it must continue, not only in communications and earth observation sensors, but also other areas, such as ocean sensing. This may well be the next area to provide us with a commercial opportunity for the application of remote observations from space. NASA R&D over the next few years will be the key to this possibility.

Second, we believe that a Federally funded interim period is a requisite required if the transition from Landsat to a commercially operational system is to be successful. Again this can be best illustrated by analogy to the historical development of commercial communications satellites. NASA developed technology, starting with project Score, Echo and Relay, through the Applications Technology Satellite series, has demonstrated many of the principles and key technology employed in today's geosynchronous communications satellites and will continue, through todays proposed Advanced Communications Technology Satellite Program, to provide the basis required to nurture and maintain America's leading role in communications technology. That ATS–6, for example, was a key element in this development is universally agreed. However, ATS–6 bears little resemblance, in detail, to the commercial spacecraft predicated on its technology. We anticipate the situation will be much more the same between Landsat D and the ultimate operational earth observation system.

To be specific, present Landsats are basically R&D spacecraft where development and demonstration of new technology is the principal goal. In comparison, operational systems utilize developed technology and apply improvements through planned implementation where economy is the governing factor. This results in a lower cost, value engineered spacecraft, like the TIROS series, which is tailored to suit its operational mission and producible at efficient cost levels. The economies in

operational space hardware are extended to its ground segment where management and processing systems are employed to promote effectivity with lower cost.

A comparison of the operational philosophy and costs between the Landsat and TIROS systems illustrates this rather emphatically. The main reason for this is that in the case of an R&D spacecraft routine operations have not yet been established and so more unique situations are encountered, both in spacecraft control and in data processing. The operational system, on the other hand, is more routine in nature and can therefore be accommodated by a philosophy which focuses on efficiency and cost reduction.

Third, the concepts of open skies, national security and international commitments present, in my mind, the most difficult problem in the implementation of a commercial initiative. I assume that national security is the foremost principle in devising the protocol for commercial operation of this system. Therefore, some form of government control and monitor must be defined and exercised. It is also not crystal clear in my mind is the review of this bill if the MSS is the singular device to which non-discriminatory data access is intended.

My difficulty has origin in Title III, and I believe the opportunity for error exists in the Title III definitions of Multi-Spectral Scanner and its data in III b(1) and (2). It could be construed that these paragraphs constrain non-discriminatory access to the data quality and format of the multi-spectral scanner. If, on the other hand, this access applies to all instruments that may be part of a Landsat system, then the national security issue becomes more accute since the resolution potential of a Thematic Mapper and Multi-spectral Linear Array, as well as the enhancement of stereo sensing, will generate information whose general access could severely diminish the security of our country.

However, it is still my position that a privately operated remote land sensing system can be consistent with national security and international commitments while supporting development of a commercial market. Concerning the national security issues, government regulations and review procedures can be implemented and imposed on the commercial operator, as suggested in this bill, that could restrict those scenes and/or spectral bands where concerns would be present. As far as international commitments are concerned, I believe relatively open access to the MSS-type data which we understand to be the root of our international commitments does not preclude a viable commercial market development strategy. Again, in this area governmental regulations and policies can be made to adequately control the commercial operator to insure compliance with international commitments.

Fourth, the "open skies" policy does not necessarily preclude commercial market development, particularly for the potentially high value data. A reasonable number of potential high value users place a higher weight on timelines of data, rather than exclusivity. Although to be sure at least some of them would like exclusivity, it does not appear to be a necessary requirement in market development strategy. Long term archiving of all data taken does not necessarily cause an inconsistency with either the needs of users of "timely" data or the "open skies" policy which insures nondiscriminatory access. It is possible to satisfy both timely, high value data and non-discriminatory access through a rule where data is aged before delivery to the archival access.

We believe this to be consistent with the "open skies" policy since the procedure for servicing requests would be nondiscriminatory, consistent, of course, with national security concerns, and all data would ultimately be made available from the archives.

Fifth, it is my position that it is critical to the preeminence of American technology to continue a strong program of technology development in the area of land remote sensors. This continued development of detector technology is not inconsistent with a commercial earth remote sensing system, but is in fact required to insure the viability of such a system. As a specific example, we feel the Multispectral Linear Array [MLA] detector technology development, currently being sponsored by both NASA and industry will be an important element of the next generation earth remote sensing system and will be the key advance necessary to expand and maintain a U.S. commercial market in the late 1980s and/or early 1990s. We encourage the development of these technologies to continue under both commercial and government auspices in order to provide our industry with the instruments necessary to support the remote sensing requirements of the future.

Sixth, on the key area of data continuity, I believe that it is possible to insure the continuity of data past Landsat D', provided Landsat D' meets its specified lifetime. I should point out that this will not be a trivial task given the realities of the schedule and programmatic constraints a spacecraft system of this complexity must deal with.

Furthermore, if we are to meet the goal of data continuity reliably, with realistic instrument and spacecraft schedules based on experience and a competent assessment of what is required, it is imperative that the government move expeditiously. I believe the authority of the current bill is satisfactory to support the transition system adequately and believe that the presently constituted Source Evaluation Board could be maintained as the most timely approach and authority to implement the dictates of the bill. This body could modify their past work in a manner consistent with this legislation in a relatively straightforward way resulting in significant time savings compared to starting the entire process again from the beginning. A six month delay, for example, would seriously jeopardize the continuity of data after the demise of Landsat D'; a delay of more than a year would virtually guarantee discontinuity.

It cannot be over-emphasized that the key to continuity of data is timeliness of implementation. The current legislative language, specifically the language in Sec. 201 and Sec. 302 of the bill provides a completely rational implementation approach which is acceptable as a basis for the transition period and future operations.

Finally, on the topic of government oversight, regulation and responsibility for future private operation of land remote-sensing satellite systems, it appears as if the proposed legislation, specifically Title IV and Title VI provides a satisfactory framework for the requirements and constraints governing an owner/operator under the proposed legislation.

That concludes my prepared statement and I wish to thank the Committee for this opportunity to express my views.

Mr. VOLKMER. Thank you very much, Mr. Schmidt. I'm sure you'll be able to answer the questions that the committee will pose to you.

First, I'd like to get some, what I call, basic questions with regard to the legislation.

Do you feel that the legislation that has been introduced, which you've addressed in your statement, is premature?

Mr. SCHMIDT. Well, no, just really the opposite. We've been watching this for a long time, and we're somewhat concerned with investments that we would have to make to pursue the commercialization opportunity. And there seemed to be a whole lot of confusion. The sense of Congress seemed to be against it, and we really were concerned with making large investments and then turning around and finding Congress, which was reasonably obvious, or seemed obvious, was against it, and it would put the whole thing back into another type of business.

Mr. VOLKMER. In other words——

Mr. SCHMIDT. We're happy.

Mr. VOLKMER [continuing]. It will help in the commercial and for those that are looking at this to know that the Congress, if the RFP's come in later on and the administration says, "We're approving this. We want to do it"—it helps to know now that the Congress is looking toward commercializing these, also?

Mr. SCHMIDT. Well, that's right, because the Congress is where the policy is made, and no matter what someone else might want, if it's not going to be acceptable here, then we're going to waste a lot of time and effort.

Mr. VOLKMER. All right. Now section 302 of the bill provides that the Secretary contract for the availabiiity of certain minimum quantities and qualities of data. I want to ask whether these specified quantities and qualities are reasonable.

Mr. SCHMIDT. Yes. We—we definitely think they are.

Mr. VOLKMER. On the quantity level of 1983 Federal purchase should be available. Is this burdensome on any contractor?

Mr. SCHMIDT. We don't see any burden with filling that requirement.

Mr. VOLKMER. You can do it with the system that you have or systems that are contemplated?

Mr. SCHMIDT. Or systems that we are contemplating, yes.

Mr. VOLKMER. And the quality? We're talking about an MSS equivalent data in order to have continuity.

Mr. SCHMIDT. I think, from a technology standpoint, MMS is the lowest point from which you will see data. From here on in, all data will be of higher quality.

Mr. VOLKMER. Would this in any way, this MMS equivalent, limit the technology?

Mr. SCHMIDT. No.

Mr. VOLKMER. All right.

Mr. SCHMIDT. As I said, it's the—it's right now the standard, and there are sensors already in operation and being developed which will increase that capability.

Mr. VOLKMER. Right.

Mr. SCHMIDT. Quality.

Mr. VOLKMER. Twenty-meter or thirty- or forty-meter resolution and——

Mr. SCHMIDT. As low as 10.

Mr. VOLKMER. Down to 10. All right. Stereo, also?

Mr. SCHMIDT. Yes.

Mr. VOLKMER. Now you've addressed some other questions in your statement on national security policies and open skies, and applied to both MSS data and any other advanced technologies, how these apply. Now the intent of the bill to make these requirements binding on the operator for all data sales—do you think that this will affect the prospects for successful commercialization?

Mr. SCHMIDT. Well, I think——

Mr. VOLKMER. In other words, they're going to have to—the national security concerns and the open skies concerns addressed in the commercialization of these satellites.

Mr. SCHMIDT. I think that course becomes more sporty if all your data is high resolution, and I think national security enters into the picture much quicker and more often.

Mr. VOLKMER. Well, do you think in any way that that will affect the commercialization if it's restricted?

Mr. SCHMIDT. Well, I do think——

Mr. VOLKMER. Or let's say if it's censored in any way by DOD.

Mr. SCHMIDT. Well, it certainly would cut down on some part of the market, even if that were only some adversarial countries that we deal with that wanted to buy the data, and you couldn't sell it to them. So from a standpoint, yes, it would have to cut down. Would it—would it severely limit the idea of commercialization? No, I think it still could be worked out with proper rules and regulations.

Mr. VOLKMER. I will recognize the gentleman from Florida, if he has any questions, before we go make this vote.

Mr. MACKAY. Your comment that it causes a great deal of confusion and concern when it's not clear which direction Congress is going to go is interesting to me because Congress is essentially reacting to what is lack of policy elsewhere. It's also not clear

where the administration is going to go or who's making the policy in NASA.

What is your view of having a business advisory group or a commercial sector, private sector advisory group involved with NASA, so that these spinoff ideas, as this originally was, could be evaluated and priorities could be set, so that we're not playing catchup ball on this kind of issue?

Mr. SCHMIDT. I think that a business advisory group would be useful, and it's one of the kinds of things that we don't do often enough in this country because of the way we have—

Mr. MACKAY. Thank you, Mr. Chairman.

Mr. VOLKMER. We're going to—let's see, maybe I can finish up with a few other I have before we go to vote.

In your statement, also, you provide, "It is not also crystal clear in my review of this bill if the MSS is a singular device to which nondiscriminatory data access is intended." And maybe that's not clear in the drafting of the legislation.

The intent—or our intent, those of us that worked with it, is that the nondiscriminatory part applies to all data.

Mr. SCHMIDT. To all data?

Mr. VOLKMER. Right. And the question of that also as to people who want timely data—in other words, we see no problem with your charging additional for that, making a different charge for that, as long as you provide access to everybody that may want it.

Mr. SCHMIDT. Well, our statement was that we saw a scenario where someone would request a specific plot of data; that it was deemed correct and OK with national security. You take that data and you give it to him, and if no one else has requested it, then the timeliness is upheld. He has his data, and then after some aging process, you allow that data to go to the archives and it's available for everyone. And I don't see, you know—I don't see where that is inconsistent with filling—it might be a compromise of some things, but it's not inconsistent with filling the needs and the terms that are used.

Mr. VOLKMER. I'd have to say that I, for one, will have to take a look at that. I hadn't thought of it. In that instance, now that you mention that, that would appear to basically conflict with what we've been thinking of doing, but I can see the reasoning behind what you're saying.

Mr. SCHMIDT. Well, if someone else asked for the same data, you would have to give it to them——

Mr. VOLKMER. Right.

Mr. SCHMIDT [continuing]. On the same basis.

Mr. VOLKMER. Right.

Mr. SCHMIDT. So that would be nondiscriminatory. But how soon he gets it could be a determination of, if he was the only one that asked for it, you'd give it to him as quickly as possible, and you hold it for a while before it goes to the archives.

Mr. VOLKMER. What if you had somebody that said, "I'd like to have it at the same time John Doe's getting it from you," and you say, "OK"——

Mr. SCHMIDT. Well, he'd had to define what the data is, not just what John Doe said.

Mr. VOLKMER [continuing]. I know. I know. OK.

I'm sure that those type of things can be worked out.

That's—it's possible, you say, "to satisfy both timely high-value data and nondiscriminatory access through a rule where data is aged before delivery to the archival process." [sic]

Of course, what we look about on the archives is basically it's like a library. You understand that?

Mr. SCHMIDT. Yes, and anyone can go in and access the data and pay some reproduction costs and go away with it.

Mr. VOLKMER. OK. I'm going to recess at this time, and we've got another vote on.

And we do have additional questions here that we'd like to submit to you in writing, and I'd like to have your response within a reasonable time.

Mr. SCHMIDT. We'd be happy to cooperate.

Mr. VOLKMER. And when we return, we will proceed with our final witness, Mr. Brian Hughes of U.S. Aviation Underwriters, Inc.

[The questions and answers follow:]

Hearing Record rec'd

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harles A Schmidt
sion Vice President
General Manager

December 21, 1983

Congressman Harold L. Volkmer
Chairman Subcommittee on Space Science
and Applications.

Congressman James H. Scheuer
Chairman Subcommittee on Natural Resources,
Agriculture Research and Environment

Committee on Science and Technology
Suite 2321 Rayburn House Office Building
Washington, D.C. 20515

Dear Congressman Volkmer and Congressman Scheuer:

Thank you for your letter of December 2 with the enclosed additional questions on the topic of the "Land Remote-Sensing Commercialization Act of 1983". I appreciate this opportunity to amplify RCA's position on this critical and timely topic.

Attached please find my responses to and comments on the specific points raised in your enclosure. For clarity and ease of reference, I have organized my responses consistent with the numbering scheme of the questions.

Again, thank you for the opportunity to participate in your deliberations and if my staff or I can, in any way, be of help during future consideration of this Bill, we would be pleased to do so.

Sincerely,

Charles A. Schmidt

RCA

SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS

Hearings on Land Remote-Sensing Commercialization Legislation

Questions for All Witnesses

1. The bill was drafted to reflect the following principles ("a" through "j") which summarize the lessons drawn from several previous hearings. Do you think these are valid and useful principles? Do you think the bill reflects these principles? Do you have any specific comments on individual items? (Note that there are some related questions below.)
   a. If we really want to commercialize, we should let the private sector make most of the critical decisions -- we should give them a clear framework in which to operate. For example, we should not dictate technology.

   b. We have had much testimony that data continuity is very important, and in particular that the lack of continuity has adversely affected the market for Landsat data.

   c. A truly commercial system will be driven by user needs -- which may or may not require state-of-the-art technology.

   d. In the beginning, some government subsidy may be needed, but we should encourage the private sector to compete to see how small the subsidy can be.

   e. Phased commercialization starting with the ground segment -- i.e., marketing -- is the most promising approach. Since the existing Landsat system is virtually all in place, its operation is not challenging, but marketing the data it generates is a challenge and perhaps an opportunity.

   f. Both "open skies" (i.e., non-discriminatory access to data) and considerate treatment of foreign ground stations are important U.S. foreign policy concerns. The "open skies" policy should be maintained.

   g. Continuity of competition is important. One-time competition at the time of a contract award is not sufficient.

   h. The value-added business is healthy, commercial, and entrepreneurial. It is the principal stimulus for potential market demand. We should not let anti-competitive practices affect this industry.

   i. Weather satellites perform an inherently governmental function and should not be commercialized.

   j. The Federal Government should continue research in satellite remote sensing.

2. The bill expressly places the responsibility on all operators to sell data on a non-discriminatory basis (i.e., equal availability and equal price for the same services to all comers). In this the bill would maintain the current U.S. policy of "open skies".

   a. Can a healthy market be developed within such a policy framework?

   b. Is such a policy socially and economically just?

   c. Is there any feasible alternative that could preserve our current international policy?

   d. Are there foreign policy benefits to the U.S. from maintaining this policy?

   e. Under private sector operation, should there be public disclosure of the names of those purchasing data and the scenes that they have purchased?

   f. Should a listing of all available scenes be published by the operator? How promptly should this listing be published?

3. Some of the problems that the SEB has had in writing the RFP have been related to national security.

   a. One problem is that any system operator may be required to have certain excess capacities or standby capabilities to meet national security requirements. Who should pay for any extra costs of such requirements? Should civilian users pay? Should the Department of Commerce pay? What is your view of Sec. 608 (c) of the bill, which authorizes the Secretary of Commerce to require agencies to reimburse a licensee on the basis of such requirements?

   b. If DOD (for example) were to have a strict requirement for a highly reliable and continuously available (if not continuously utilized) capability, should this capability be maintained as part of a commercial system or should it be pulled out of the commercial system and operated totally as a DOD system?

   c. Assume the following case: A private operator receives a federal license under Title IV to launch a particular sensor. A year later, the license is revoked because the government has become aware of potential applications of the sensor which could compromise national security. Should legislation explicitly foresee this type of situation? If so, what remedies for the operator would you suggest, if any, to compensate him for lost revenues?

4. The draft bill (in Sections 202 and 303) treats any product beyond the raw data as a "value-added" product which can be sold by the operator only with certain restrictions.

   a. Are existing anti-trust laws sufficient to offer protection to the value-added entrepreneur?

   b. Do any additional steps need to be taken to stimulate the value-added industry?

5. Under this bill, the operator of the future system under Title III could very well be different than the operator of the present system under Title II.

   a. Does the Title II operator have sufficient motivation to be aggressive about expanding the market for data sales? Or would he basically serve as caretaker of the current system?

   b. Are the provisions of the bill sufficient to build up a market under Title II that will be of benefit to the operator under Title III? (i.e., does the clear separation between these two operators enhance the competition and diversity of the industry as we intended?)

   c. Where do you think the market will be for the Title II operator? For "MSS" (Multi-Spectral Scanner) data? For "TM" (Thematic Mapper) data? How about for the Title III operator?

   d. Title III posits a period of six years of government support after which industry will presumably be able to determine whether land remote-sensing is a viable commercial enterprise. Is six years (after the demise of Landsat 5) sufficient time to make an assessment about the feasibility of private land remote-sensing ventures?

6. The draft bill represents an honest attempt to commercialize land remote-sensing as rapidly as possible with minimal government subsidy. As such, it offers no special protection for States, for Federal agencies purchasing data, for university researchers, or for current and future foreign users. Should the bill contain provisions to protect or subsidize such users?

7. The bill, in Title III, provides for at least six years of data continuity for MSS data. Advanced technologies may be employed at the operator's expense.

   a. Should data continuity linked to past and present needs remain the goal of this bill? If so, is the approach outlined in Title III a useful means of guaranteeing such continuity? If not, what is the government's minimum responsibility?

   b. Is it appropriate that the private sector make the high risk decisions necessary to implement advanced technologies? If not the private sector, then who?

c. Is there any reasonable way for the government to ascertain in advance the market for advanced technology?

d. Is it reasonable to assume that the use of advanced technologies should and will be user-driven? Should the government, through legislation, push specific technologies on users?

e. Is the six-year period specified in the bill sufficient to allow present users to amortize the investments already made in equipment and training?

8. In Title II, the bill effectively terminates government involvement in satellite hardware with Landsat D'.

a. How old is this technology, i.e., when was Landsat D' designed? Have there been advances since then?

b. Is there any compelling need to continue production of the Landsat D series? Would it not be more efficient to produce newer technology?

c. Can the private sector react efficiently to prevent or minimize a data gap after the demise of D'?

9. The bill in Sec. 403 (b) encourages Federal agencies to enter into consortium-like relationships with the private sector.

a. Are there any potential conflicts-of-interest in such a plan?

b. Could such a consortium help to serve the individual needs of various Federal agencies? Could it enhance the viability of remote-sensing industry?

10. Does the United States have any obligations to the countries that have invested several million dollars in their Landsat receiving stations?

11. How should the government treat any private sector plans to begin ocean remote sensing?

12. Should any private operator of a remote-sensing system be required to maintain a data archive?

Question 1

a. RCA agrees with this statement with some reservations. The private sector should be responsible for the key decisions but the government should establish some form of minimum criteria to give a reasonable assurance of success. The bill would benefit from some clarification on the points of technology as it specifically calls out "MSS data" in several cases that should be deleted in favor of a more general statement on the appropriate technology.

b. Data continuity is critical to the successful commercialization enterprise. Furthermore, as in any commercial market, reliability and continuous availability of products are required if the customer's confidence in and use of the data are to be achieved. It should be pointed out, however, that data continuity is not the unique requirements and should not automatically be emphasized over data quality and reliability of delivery which are also critical.

c. This statement is true of any commercial enterprise and remote land sensing is no exception. User needs must drive both the operational system and R&D. Our analysis shows, however, that in the case of earth remote sensing state-of-the-art technology will be required to insure commercial feasibility.

d. Subsidy will be required to allow an orderly transition to a commercial operational system. As with all such programs, the government should foster competition to both minimize the subsidy and ensure that a timely viable commercial entity emerges that will not require permanent government subsidy. This should be, in our opinion, the ultimate goal of both the legislation and the RFP process.

e. Phased commercialization can be detrimental to successful commercialization. The initial operator during transition must be the final operator after transition. This is necessary to build the experience and capability to expand the market. It is, however, entirely possible to have the transition phase as a contracted phase with the final operating entity. This is further expanded in the response to Question 5, below. The same concerns expressed in Question 1a above about minimum standards also apply here.

f. The "open skies" policy as originally stated should be followed. Question 2 treats this in more detail.

g. Competition at any intervals short of that necessary to make this a going business is undesirable and may well prevent companies from bidding. There is no incentive for a company to take all the risk only to have their activity compete again once it begins to pay off. If commercialization is successful, competition for further government subsidy will be unnecessary provided the contractual period is adequate for rationale transition. As far as competition for data sales to government in the post transition period is concerned, we feel the government should do so if they determine it is in their best interest.

h. We are in total agreement with this objective. Any value-added element of the winning entity must compete on equal terms with all other value-added companies.

i. We completely agree with this position. As we have previously stated, the owner and operator is the government; the taxpayer the ultimate customer.

j. The continuation of advanced research with sensors and related technology by the govenment is essential to maintain U.S. leadership, however, competition with private industry in operational use of these data must be avoided.

Question 2

a. A healthy market can be maintained under the "open skies" policy as stated, that is "equal availability and service" for the same price. Current restraints, for example most industrial users do not want to have disclosed the area coverage they are interested in, should be maintained as they are at present. Further, most users would desire some opportunity to use data that is collected at their specific request before it appears in an open archive. The equal availability of specified service meets the "open skies" policy.

b. We believe this policy to be socially and economically just.

c. The open sky "equal availability and service" policy is adequate. However, one must not penalize a user who is capable of exploiting this data by publicizing his unique collection requirements.

d. The foreign benefits cannot be quantified but probably exist depending on what the Europeans, Russians and Japanese do.

e. From a. and c. above, it is clear that the answer is no. Industry is always willing to buy a service or data that may through proper application give them a competitive edge. That's what the free enterprise system is all about. At present, under the current LANDSAT system, this information is not disclosed and we see no reason to deviate from this policy. In fact, our market analysis indicates that public disclosure of details such as these may well be catastrophic to commercial market development.

f. A list should be published, as available, of all scenes collected for synoptic coverage. However, unique scenes location, spectral intervals, etc. bought and paid for by a specific customer should not be listed from a time sufficient for that user to benefit from his request (6 months to one year). This situation does not prevent another customer from requesting that same coverage, which would also be treated as a new request, i.e. collected and provided to the new user.

Question 3

a. Those specific costs above doing "normal business" that relate to the national security requirements should be reimbursed by the government. Such reimbursement could be either by Commerce or DoD.

b. If DoD wanted to increase the probability of continuous coverage, the least expensive approach would probably be to enhance the existing commercial system. This can never be stated for certain until a specific system can be studied.

c. A specific license to fly a new sensor would be based on the exploitation of a new or expanded market that both the government and the commercial entity felt would be beneficial. If in the course of operation it was found that these data were of interest in a national security sense, three courses of action are open: 1. continue as is and accept risk; 2. continue as is with the U. S. government the only customer; 3. cut off sensor output. In the first two cases, the commercial entity receives its return on its investment. In the last case, we believe the government should be responsible to compensate the commercial entity for its expense and lost revenue.

Question 4

a. It is our opinion that today's anti-trust laws appear adequate.

b. The value-added industry needs further stimulation but mainly through applications research and education of the data users. Simulation of the value added industry in general is a logical function of the commercial operator of the system since it would serve to extend his market. We would anticipate a major effort to do this.

Question 5 4

a. The present potential separation of Title II and Title III is detrimental to the commercialization of the LANDSAT system. It is absolutely vital that the same entity do both. This is necessary to not only have an incentive to build the market, but to gain experience in developing the next phase. See also answer to Question 1.e.

b. See answer to Question 1.e and 5.a.

c. As stated above, there should be no separation between the commercial entity for transition through full commercialization. The sensors will evolve as the market strategy dictates and this cannot be done with discontinuities in the operations.

d. Six years appears to be a minimum, 10 or more would be more effective in order to lay a good business basis. The time constant from the introduction of a new capability to its exploitation is on the order of 5 to 7 years. If the time is too short, it prohibits the entity from investing into long range improvements that are essential to maintain and expand the market and the U.S. leadership. It is essential that the commercial operator be motivated by long term business development for the transition period to be successful. Only in this way can the true objective of the commercialization effort be realized.

Question 6

a. An effective market strategy must in itself "increase the market" which is not done by reducing customers. For this reason, the commercial entity will do all it can to foster university research, state and local government use as well as expanding the foreign markets. Therefore, special provisions do not appear necessary. This effort should not be construed as pre-empting or any way interfering with efforts by the government to acquire data for research purposes from the entity. This data could be forwarded to universities and/or other researchers under license agreements on similar instruments. This, in effect, would allow subsidy of research if deemed beneficial to the common good.

Question 7

a. The approach to data continuity provided in the present bill is good. A good market plan will continue existing customer support until those customers are ready to move to more advanced data. As stated earlier, the response of the market to a new type data is very slow, from 5 to 7 years from data entry to full exploitation.

b. The private sector, through experience gained in the transition, market analysis and surveys, must be the one to make the decision to bring new technologies into the operational system. This must be a market driven not technology driven decision. Foreign competition will also have an influence on this.

c. The government should try to assess the market need for advanced technology but not alone. It should also work closely with the private entity operating the commercial system.

d. Legislation cannot be expected to drive the market. As stated above, application of advance technologies will be by user and, therefore, market driven. There should be no legislation promoting specific technologies for use by the commercial entity. The government should continue, however, to sponsor a rigorous basic Research and Development program through NASA and other appropriate agencies to provide the basic technology from which commercially viable sensors can be developed.

e. As noted in Questions 5.d. and 7.a., the six year period is an absolute minimum and will probably not be sufficient, 10 years would probably be preferable.

Question 8

a. LANDSAT D' is basically 1975 technology. Other more cost effective solutions are possible now.

b. There is no compelling need to continue the LANDSAT D' series. The present technologies coupled with the design of an operational vs. research system would yield distinct cost advantages.

c. The question of a data gap between D' and a follow-on is totally related to the life of D'. The time it takes from go-ahead to flight of a follow-on will not vary radically among viable aerospace contractors. If LANDSAT D' meets its specified life and if there are no major delays in enabling legislation and/or the RFP process it will be possible to avoid a data gap after the demise of LANDSAT D'.

Question 9

a. Potential conflicts-of-interest only lie with a single market (government agency) having an undue influence in the evolution of the industry.

b. In general, a consortium may hinder the development of new markets and should be carefully evaluated. This is not a strong position but one of the unknowns that should be further evaluated on a case by case basis.

Question 10

Yes, at least a moral obligation to try to minimize any impact due to our changes of policy.

Question 11

If the private entity can establish a sufficient market basis for observational ocean sensing, it should be allowed to proceed as long as it is not detrimental to the national defense or national interest. This should not be construed as a conflict with either systems that provide for military needs or with basic science programs that pertain to ocean observations.

Question 12

The establishment of a non-government data archive should be a business decision. It does appear that some level of archiving would be in the best interest of a private enterprise, whether required or not. The government should retain the option to archive any data the commercial operator may choose not to. The government should also retain the right to reclaim archived data from a private library at any time if required by national security considerations.

Mr. WOLKMER. Thank you very much, Mr. Schmidt.

Mr. SCHMIDT. Thank you, Mr. Chairman.

Mr. VOLKMER. We appreciate your input.

[Recess.]

Mr. SCHEUER. The committee is convened.

I'm going to ask unanimous consent that additional statements may be received and included in the printed record.

There being no objection, so ordered.

[Additional statements provided for the record are included in the appendix to the hearing.]

Mr. SCHEUER. All right. We'll be hearing our last witness of the day, Mr. Brian Hughes of the U.S. Aviation Underwriters, Inc.

Mr. Hughes, your prepared statement will be printed in full at this point in the record. So what I suggest is that you simply chat with us informally, giving us the highlights of your testimony, and don't hesitate to refer to anything you may have heard today, any of the views that elicited your interest or concern this afternoon.

And with those comments, let me welcome you here. Let me thank you for your patience. It's late in the afternoon.

And why don't you take 8 or 10 minutes to chat with us, and then we'll probably have some questions for you.

STATEMENT OF BRIAN HUGHES, SENIOR VICE PRESIDENT, U.S. AVIATION UNDERWRITERS, INC.

Mr. HUGHES. Thank you, Mr. Chairman.

And I thank those of you in the audience who decided to stay for the dull part of the show, insurance.

I've been asked to comment on the committee print of the bill, which was forwarded to me, and I'm going to really talk about two sides of it: One, just my own opinions of the bill itself, and the other one being the insurance issues that I think are applicable to

the commercialization of land remote-sensing technology in the United States.

First of all, I would say that I believe the bill is a viable vehicle for commercialization and that the separation of the existing system and future systems is a good device in that it will enable the title II vendor to focus on the marketing of the existing data and the operation of the existing system while allowing a title III vendor to focus on research and development, the development of markets for future data, and separate these two different aspects of land remote sensing.

On the question of insurance, we have insurance issues that apply to both the title II and title III sections of the act as proposed. In the title II context, we really have the ongoing operations of the existing Landsat spacecraft. I will venture to say that if the insurance industry was at this point asked to insure the existing in-orbit spacecraft in the Landsat series, the rate would probably reflect the perceived unreliability of the existing spacecraft. If the Landsat D′ spacecraft is successfully launched in February 1984 and goes through its initial in-orbit tests, working and appearing to survive, at that point I think the industry will be ready to step forward and insure the continued in-orbit operation of Landsat D′.

The other thing, of course, the title II vendor will be asked to sell and market will be the existing data which is archived. One of the questions that has occurred is, should that data in the archives be insured?

The title II vendor may well wish to procure insurance for basic business interruption in the event that the archive is destroyed and they have nothing to sell. However, standard loss control procedure would suggest that, rather than just buy insurance, the data base should be duplicated and stored somewhere in a secure facility offsite.

When we go to title III operations, in which case I think we're talking about the launch of a new satellite system, we're really not talking about anything too terribly different than is currently being done by the space insurance industry with existing communications spacecraft.

There's specifically four basic insurance products that would come into play. There is launch insurance, launch liability insurance, in-orbit insurance, and perhaps business interruption coverage during in-orbit operation.

Launch insurance would essentially cover—would insure that the spacecraft is successfully launched, placed in the required orbit, and happened to work once it got there. In the event it failed to work or didn't get to where you wanted it, the insurance community would be willing to indemnify the title III vendor for the cost of relaunching another spacecraft.

The launch liability insurance is essentially currently required because, due to current U.S. Government policy, it passes through the liabilities the U.S. Government takes under international treaty for any damage caused by an object launched from the United States, any damage this object caused to other nations or any other party. And the current policy is that NASA requires anyone flying on a NASA vehicle to purchase $500 million of third party liability insurance indemnifying the U.S. Government. And

since this appears to be U.S. Government policy to pass through this liability, I'm sure this liability insurance would be required for the launch of land remote-sensing spacecraft.

In-orbit operation insurance essentially insures the continued operation of the land remote-sensing spacecraft in orbit. And in the event a spacecraft was to fail it was in its operational phase, insurance would provide enough funds to relaunch an additional spacecraft or the depreciated value of that in-orbit asset, whichever was less, though this kind of policy can be negotiated and it's fairly flexible.

One thing I should stress—that none of the policies I'm describing at this point are off-the-shelf forms. You can't walk in and say, "I would like space insurance," and I pull out a piece of paper, write in your name, and sell you a policy. The contracts are subject to negotiation because the technology is a long way from being mature and stable and is subject to constant innovation.

I will say that the insurance industry has worked hard to keep up with the rapid innovation in the space industry, in that, you know, the marine business took hundreds of years to develop, and we had a nice, long time to figure out how to insure a ship. Figuring out how to insure spaceships is something else again, because the technology moves at a very rapid pace and, as I think the chairman would observe, large institutions often have a hard time adjusting to rapid technological change, and we suffer the same problem.

Finally, business interruption insurance is something that would be bought by title II or title III vendors in the event that they would set up a business which was dependent upon the consistent flow of data. This could also be bought by companies who had been set up to do value-added processing to land remote-sensing data, in that while they may not be the primary source of data, they do things with it and sell it for profit. And if their data source is interrupted, through no fault of their own, they're out of business. And this is a product that I am sure the insurance community would be willing to provide.

The question has been asked whether ground system insurance would be required, and I think that the Earth stations which will be needed to receive this data will be fairly valuable assets that one will want to insure. This will be a fairly traditional ground cover, no different than insuring the local grocery store or factory, and, as such, the insurance for these ground stations should be readily available from many competing insurance sources.

The last possibility is that some user who has grown dependent on Earth remote-sensing data would sue because their data stream is interrupted. The current technique for handling these kinds of concerns is to write specific clauses into the tariffs—specifically in the communications industry the tariffs prohibit a user from suing for consequential damages as a result of interruption of communication service. The remedy which they have is simply that they don't pay for the service they didn't get.

Now there has also been a precedent established where liability insurance is available that would indemnify the vendor in the event someone managed to break through the tariff and go against, directly against, the title II or title III vendor.

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To summarize, space insurance is truly a free market. And what I mean by that is it goes up, it goes down; supply increases, supply decreases; and demand seems to be on a constant increase. So there is no way at this time for a cautious insurance underwriter to predict what the rates will be, what the terms and conditions will be, of insurance products for land remote-sensing spacecraft when they finally do enter the space insurance market.

However, recent insurance in the space insurance industry has proven to be rather expensive, and we've learned our lessons and we've paid for learning them. However, the space insurance industry does remain. We have matured, and we are developing a technical understanding of the risks which we are trying to insure.

I think I speak for the entire U.S. space insurance market when I say that the space insurance industry and the space insurance market is ready, willing, and able to insure land remote-sensing spacecraft when they are commercialized and go into the space insurance market for insurance coverage.

Thank you. I'm ready for questions at this point.

[The prepared statement of Mr. Hughes follows:]

Statement by

Brian G.R. Hughes

Senior Vice President - U. S. Aviation Underwriters, Inc.

before the

Subcommittee on Natural Resources,

Agriculture Research and Environment

and the

Subcommittee on Space Science and Applications

Committee on Science and Technology

The United States House of Representatives

November 9, 1983

Land Remote-Sensing Commercialization Act of 1983

My name is Brian Hughes. I am a Senior Vice President of U.S. Aviation Underwriters, Inc., managers of the United States Aircraft Insurance Group (USAIG). I am involved in the underwriting of commercial space projects for the USAIG's Group III Satellite Pool.

The views in this testimony are strictly my own and do not necessarily reflect any authorized or official view of U.S. Aviation Underwriters or USAIG.

I have been asked to comment on the October 26, 1983 Committee print of the proposed "Land Remote-Sensing Commercialization Act of 1983," which I will hereinafter refer to as the Act.

I will first comment on the viability of this Act as a transition vehicle between full Government operation and complete commercial operation of a land remote-sensing system. I will then address the proposed Act from the perspective of a Space Insurance Underwriter. Finally, I will pose some issues that may need further exploration prior to the implementation of the proposed Act.

SUMMARY

I believe this Act is a good vehicle for transferring Remote-Sensing operations to the commercial sector. The availability of insurance should not be a barrier to such a transfer.

Vendors proposing a program under Title II of the Act, which requires the insurance of the existing in-orbit space segment, will find that such insurance costs will reflect the currently perceived unreliability of the Landsat spacecraft. The successful launch of Landsat D-prime in February 1984 will ease the situation. Insurance for programs proposed under Title III should be as available as insurance for communication satellites bought at the same time.

THE ACT

The proposed Act is a viable vehicle for transferring land remote-sensing operations to the commercial sector.

Separating operation of existing spacecraft and sales of existing data from development of a new system will enable continuity of service while providing the best opportunity for innovation in the provision of new services.

A Title II vendor can focus its efforts on the management of

the existing system and the sale of the existing data. The Title III vendor can focus its efforts on the development of a system that provides the services the market wants at the lowest cost.

The Act provides an adequate framework for the transfer of land remote-sensing to the commercial sector. Section 301 (3) of the Act specifically recognizes that private operation of land remote-sensing may not be in the best interest of the Nation. Given that foreign competition is about to begin in this arena, I believe that such a transfer is likely to be in the best interests of the Nation. Given sufficient competence such a transfer is likely to be profitable.

INSURANCE ISSUES

There are two separate insurance questions. The first is in regard to Title II operations, and the second is in regard to Title III.

Title II Operations

The current perception of the Landsat system reliability is such that insuring the continued in-orbit operation of the existing system and its replacement would be expensive at this time, the rate required would reflect the perceived reliability of the system. Given a successful launch of Landsat D-prime and successful initial operations Landsat

D-prime, insurance would be available at rates which reflect that success.

Title II also covers the sale of existing, archived data. Insuring this archive would help the Title II vendor survive a loss, however the insurance proceeds would not replace the data that is lost. Standard loss protection procedure would call for a separate set of back-up data secured in a different, off-site location.

Title III Operations

Title III operations could be insured in much the same manner as we handle space insurance now. We would write launch insurance, launch liability insurance, in-orbit insurance and business interruption insurance. There would be little difference between the insurance written on future land remote-sensing spacecraft and the satellite insurance written now.

Launch insurance would insure the cost of replacing a land remote-sensing spacecraft in-orbit in the event of a launch failure. It could also provide sufficient funds for the Title III vendor to continue operations through the delay caused by the loss.

Launch liability insurance would indemnify the operator in

the event the land remote-sensing spacecraft launch failed and caused damage to third parties. Such insurance would be required as the U.S. Government has a policy to pass through to launching parties the obligations of the United States under treaty, regarding the absolute liability of a launching State for the damage caused to other nations by such launch or spacecraft. Since land remote-sensing spacecraft are likely to be launched into low earth orbits there is a real possibility of land remote-sensing spacecraft reentering and causing damage to third parties. Therefore, spacecraft decommissioning procedures needs to be specifically addressed in the licensing process.

In-orbit insurance would pay the replacement cost or the depreciated value of a land remote-sensing spacecraft, whichever was less, in the event of an in-orbit failure. An in-orbit failure would be a fortuitous event which prevents the continuous flow of valid data. Since the spacecraft have a limited life, the in-orbit policy would not cover the expected end of life of the spacecraft.

In-Orbit coverage of the physical assets would likely be combined with business interruption coverage for the Title III vendor. Business interruption insurance would provide sufficient funds to maintain operations in the event the flow of data was broken due to an in-orbit failure. Business interruption coverage could be bought by both the Title III

operator and data users who have built value added businesses dependent on the land remote-sensing data product.

Ground System Insurance

Owners of a ground station will want to insure such a facility. However, this would be a standard form of property insurance and could be written by many different insurance companies on a very competitive basis. Such insurance would not specifically involve the space insurance market, though it may well wish to participate in these risks.

Suits by Data Users

The possibility exists that users could sue private sector operators if data delivery is interrupted. Such exposures are currently handled in the communications industry through tariff agreements which limit the liability of the service provider to the cost of the service not received. This would seem to be a valid method for handling a similar exposure in the land remote-sensing arena. General liability insurance would also be available to protect the operator from such suits, in the event a tariff was "broken through."

INSURANCE SUMMARY

Assuming that land remote-sensing technology has matured to a point where the risk is acceptable to underwriters, the space insurance market would be able to insure such ventures.

Space insurance is truly a free market, with all the uncertainly that this implies. The fluctuations in the market are great and the space insurance cycle is short. There is no way at this time to predict the terms that underwriters will be willing to offer, the amount of insurance that will be available or the rates that will be charged when land remote-sensing spacecraft come into the market.

Recent experience has proven to be an expensive lesson in space technology for the space insurance community. However, the space insurance market remains, and has matured. The United States space insurance market has become a major participant in the international space insurance market. I am sure I speak for all American insurance companies when I say that we are willing, and able, to share the risks of commercializing land remote-sensing technology in the United States.

GENERAL OBSERVATIONS

There are two different kinds of land remote-sensing data. The first is time insensitive, i.e., data which is used for mineral exploration. Since the fundamental data, geographical form and composition, is not changing rapidly with time the major difference between data sets will be spectrum, resolution, sun angle and time of year. Other than that, one data set should be as good as another.

The other type of data is time sensitive, i.e., data which is used in agriculture. Here the fundamental data is in constant flux. There is a value to timeliness. A commodities trader is interested in the current state of the soybean crop. The trader with a two hour lead notice of a spreading disease is in a position to profit greatly. On page 5, line 20 the term "on a non-discriminatory basis" is defined as "without preference, bias, or any other special financial, delivery, or technical arrangement which would favor one buyer or class of buyers over another." (emphasis added) Is the intent here to prohibit pricing information differently based on the time of delivery? If it is I suspect that this will effectively remove the highest margin product a Title II or Title III vendor could develop.

A sticky question will also develop with international data sales. Will data on all nations be sold by the Title II and Title III vendors? If so, will permission of the country being remotely-sensed be needed prior to such sale. If not, will any data which is sold to a third Party be provided to the "Source Nation" at no charge? . not, will multi-national companies have access to land remote-sensing data of agriculturally dependent third world economies, without the knowledge of the Source Nation? Some scheme must be developed to handle this situation. Otherwise I suspect this could become fuel for those nations who wish to restrict an Open Skies policy.

Section 603, "Nonreproduction," specifically prohibits the reproduction or dissemination of the "raw data." A major question could arise as to what level of processing will separate raw data from processed data. The motive to "cheat" the intent of the section is that if the price for data is high enough many users may group together to buy the data once, process it enough to avoid violating the letter of Section 603 and then redistribute it. This could also raise some interesting copyright questions.

Respectfully Submitted,

Brian G.R. Hughes

Mr. SCHEUER. What has been the history of space insurance? How many companies are there? How many craft are up there to be insured? What has been the failure rate, the claim rate?

Mr. HUGHES. OK.

Mr. SCHEUER. Tell us something about how it actually—tell us about the real world out there.

Mr. HUGHES. In the beginning?

Mr. SCHEUER. Yeah.

Mr. HUGHES. OK. The beginning was 1965, the launch of *Early Bird*, and at that point Comsat wished to insure its share in the *Early Bird* spacecraft. There were negotiations going on to buy physical damage insurance in the event that the launch failed, and also third party liability insurance. Comsat decided that the physical damage portion was too expensive, and they decided to buy the third party liability insurance. I believe they bought a $3 million third party liability policy back in 1965.

Purchase of liability insurance and launch insurance continued, then, up until about 1977, at which point we had our first loss, which was the loss of OTS–1, a European communications satellite which was lost due to the failure of a Delta launch vehicle. That cost the market $29 million. That $29 million wiped out all the premium accumulated since 1965.

I think the high point or the low point was 1979 when RCA Satcom-3 failed. This cost us $77 million and put us in a 300 percent deficit position—in other words, $3 out for every $1 in. That's what I mean by expensive lessons.

We then had a couple of years loss free, and then in 1982, last year, we had two failures. One was the loss of Insat 1–A, which cost the market about $70 million, and we also had the loss of Ariane, which had two spacecraft, Marecs B and Serio. Fortunately, Serio was not insured, and, fortunately, Marecs B was not insured for its full value. Marecs A had been insured for $96 million; Marecs B was only insured for $20, due to budget constraints at ESA. So we were lucky and we paid $20 million.

This year we've gone through 1983, and I will now look for honest wood and say we have not had any losses this year. So at the end of this year, all things staying as they are at this moment, we should essentially be in a breakeven position historically, but noting the fact that we do have expenses and costs, we have overall lost money in the space insurance industry.

I will say that I think the primary motivation for the insurance companies who are involved is that we think the commercialization of space will be a profitable venture for us in the long run, and I think the common wisdom is that you do not get into this business for short-term profit. As an industry—we are here to support, to help space grow. We think that in the long run it will be a profitable venture, and we are willing and able to put our capital resources behind it.

To answer your question about who's involved, the major markets are Lloyds of London—they've certainly been there from the beginning. Our firm, USAIG actually happened to write that first policy back in 1965. We're involved. There are other U.S. firms. I would say that 5 years ago it would be that about 90 percent of the market was overseas. At this point the U.S. market represents 50

percent of the world space capacity, which I would estimate to be somewhere around $200 million on any one flight.

Mr. SCHEUER. Very interesting.

Does the industry right now view remote-sensing satellites as pregnant with problems, as very problematical and high-risk enterprises?

Mr. HUGHES. No; We have insured successfully Insat 1-B, which was the followon to 1-A. This Indian satellite, which was built by Ford Aerospace, included a meteorological package for sensing the Earth from geostationary orbit. The sensor has worked and has been insured. I'll also add it's been insured by our firm and other companies around the world.

So we have insured Earth-sensing technology, perhaps not Landsat, but we have observed the Earth and have insured those sensors. So I see no fundamental difference as long as the technology which is used has some pedigree of success.

Mr. SCHEUER. Do you believe that in time the cost of insurance of these satellites will decline as we gain more experience in the private enterprise sector?

Mr. HUGHES. Mr. Chairman, that depends whether the experience is successful or not. Given a history of success, then the market conditions in the insurance industry will, of course, force the rates down. This is a very competitive industry, and it is not a regulated industry and, as a result, the market tends to go to the lowest bidder.

If the history is—or the future is—fraught with failure, rates will go up, but if there's success, rates will come down. It's a pure market.

Mr. SCHEUER. Are you familiar with the French Ariane?

Mr. HUGHES. Yes; I am, sir.

Mr. SCHEUER. Would you—oh, you insure it. Would you or do you insure the French Ariane satellite on any different basis than the same one carried on the space shuttle?

Mr. HUGHES. The rates for insurance on Ariane do reflect the performance of Ariane versus the performance of shuttle, and that is to say, without going into proprietary information, the shuttle is cheaper to insure than Ariane, and these differences are significantly reflected in the rates.

Mr. SCHEUER. Would a significant—would a relatively new prototype ELV, such as the Conestoga, affect insurance costs?

Mr. HUGHES. OK. Clearly, the insurance rate will be a function of our perception of the reliability of the vehicle. If the Conestoga is tested and flies well during its prototype flights, we will be liable to insure it at a favorable basis. If we watch a few fireworks shows, the rates would tend to reflect that. It's at this point much too early to say, but I will say that the rates will be a function of the experience.

Mr. SCHEUER. Would high reliability systems such as the Titan tend to bring rates down; bring costs down?

Mr. HUGHES. I think we would—certainly reliability is the issue. I would think that we would have to watch Titan fly on a commercial basis to see exactly how the transfer from a military operation to commercial operations would affect performance, but without committing myself to anything in the future, I would say yes.

Mr. SCHEUER. Do you think that as we proceed ahead with remote-sensing satellite systems that any new legislation is required to facilitate or regulate space insurance?

Mr. HUGHES. Well, if you could regulate success or failure of specific launches, I would be very appreciative. Other than that, the market seems to be able to handle any program that's been thrown at it so far.

One of the things we've had to cope with is the fact that initial flights—when we go back in 1977 we're talking $29 million launches, and now there are rumors that Intelsat-VI will be a $200 million launch. That's called growth, and we have to stretch to cope with that growth, but it appears that the market is able to cope with that. So from our perspective, I believe that the United States and the world market will be able to cope with pretty much any commercial venture that is thrown at us in the near time.

If you were to try to insure the shuttle at $2.5 billion right now, that would be a bit of a stretch, but I think $200 million, $300 million spacecraft might take a little work, but I think we could do the job, sir.

Mr. SCHEUER. Very interesting.

Congressman Volkmer?

Mr. VOLKMER. Thank you, Mr. Chairman.

Are you aware of any third party liability claims due to damage caused by reentering satellites?

Mr. HUGHES. There have—well, the one incidence—incident that does come—well, there are two incidents that come to mind, one a little more serious than the other. The first was, of course, the Soviet Cosmo spacecraft which landed in the Northwest Territories in Canada and spewed some radioactive debris and required a team of United States and Canadian Armed Forces to go in and clean up the mess, and for which a bill was submitted to the Soviet Union, and I believe they paid about one-third of it 2 or 3 years later. No legal action was taken in that matter.

The other incident, of course, is Skylab, which was a rather dramatic public event, and a number of frivolous suits—actually claims were filed. One that comes to mind is one woman sent a letter to NASA asking if they would pick up the tab for her hotel bill in Finland because, since that was out of the flight path of Skylab, she went there to be safe. NASA, of course, declined. But there was nothing serious.

The real answer is there has been no serious third party liability claims from reentering objects.

Mr. VOLKMER. Do you see any need for any legislation in order to provide for, regulate, space insurance for remote-sensing satellite systems?

Mr. HUGHES. The straight answer to that question is: No, there is no need. The market can cope with space insurance requirements.

Mr. VOLKMER. All right.

In your statement you mention in regard to the legislation and the sensing, land-sensing satellite system that we're proposing, commercialization, you say, "Therefore, spacecraft decommissioning procedures need to be specifically addressed in the licensing process."

Now what do you mean by decommissioning procedures?

Mr. HUGHES. The—OK. What I meant by that is, since the bulk of what I deal with is our spacecraft in geostationary orbit—the reentry time for spacecraft up there is about 1 million years—this is not a problem I worry about much. I don't even think my grandchildren will worry about it much.

However, land remote-sensing spacecraft will be a low Earth orbit and are potentially capable of reentering in our lifetimes, more specifically while I'm still working for the company. In that case, while it is a remote event, I think that, due to the liability concerns that such an object could cause, the possibility of reentry does have to be considered. It is a remote risk, but one that needs to be addressed.

It could be addressed simply by technical specifications that any spacecraft which reenters will completely disintegrate upon reentry; in other words, no lead film safes inside the spacecraft.

But I think that has to be addressed because the United States does have treaty obligations which hold it absolutely liable for any damage caused by an object launched by the United States.

Mr. VOLKMER. But your concern is basically the fact that the satellite would not burn up upon reentry?

Mr. HUGHES. Yes; that is correct.

Mr. VOLKMER. Or parts thereof?

Mr. HUGHES. I mean, that is the concern, that some damage could be caused. The statistical odds of anybody actually getting hurt are very small, but it is a possibility I think that should be addressed in the licensing procedure.

Mr. VOLKMER. And then on page 21 under "General Observations," in regard to nondiscriminatory basis of providing data, you—it says, "Is the intent here"—the question, it poses the question, "Is the intent here to prohibit pricing information differently based on the time of delivery?"

The answer to that, clearly the intent is that we do not, and I believe that was—I don't know if you were here when a previous witness——

Mr. HUGHES. That was addressed. I think the concern I had really has to deal with time limits as far as Third World nations who are agriculturally dependent.

Mr. VOLKMER. All right. Now I notice that we get to the next page, and maybe I can give you some answers to some of your questions as we go along.

You say, "Will data on all nations be sold by title II and title III vendors?" That's clearly yes.

"If so, will permission of the country being remotely sensed be needed prior to sale?" No, which is presently what the situation and we'll probably try to keep it.

"If not, will any data which is sold to the third party be provided to the source nation at no charge?" The answer there is no. If they want it, they can pay the equivalent amount, nondiscriminatory.

"If not, will multinational companies have access to land remote-sensing data of agriculturally dependent Third World economies without the knowledge of the source nation?" That is possible, but the source—any nation can inquire if they have any data that they would like to have. So they would for sure know if they're being sensed.

Mr. HUGHES. The concern I have there, sir, is that I could—one of the issues that arises in the communications business is the possibility of a "world information order," which would constrict the free flow of information.

And one of the issues that has also come up is the right to remotely sense a nation, a sovereign state without that sovereign state's permission, and the eventuality which I would propose is where the problem arises if a commodities broker dealing in bananas has up-to-the-minute information on the banana crop of some Third World nation and then cuts a deal with them when they don't have that same information. Is that in the best foreign policy interests of the United States for that kind of activity to be going on? And that is the sticky situation that could be used as ammunition for those who would like to impose a "world information order," and that is why I suggested that kind of issue needs to somehow be addressed.

I do not propose a solution. I simply note that there is a potential problem.

Mr. VOLKMER. Another thing, on the last comment that you have here on reproduction and dissemination of raw data, I appreciate the remarks that you have as to processing it just to a small degree and then going ahead and disseminating it. And we'll have to look at that feature.

But there's clearly—in the legislation we do not—in other words, we prohibit actually someone purchasing raw data and then duplicating that raw data and selling it off.

The intent of that is clear. In other words, they can sell it cheaper than where they acquired it from that way.

Mr. HUGHES. I think the question there is—in its most basic form—if I'd take the data and go produce a beautiful atlas based on that data, is that reselling the data? Obviously, within the context of the bill, that is not.

Mr. VOLKMER. No.

Mr. HUGHES. Then the question is, if I take the raw data for the State of Connecticut and sell that dataset, is that a process subset of the existing data that's sufficiently different? And, again, degrees become a bit of an issue, and that's why I raised the issue.

Mr. VOLKMER. Well, I understand that and I appreciate your raising the issue, but—and we'll have to look at that.

Thank you, Mr. Chairman.

Mr. SCHEUER. Thank you, Congressman Volkmer.

Well, Mr. Hughes, you've given us some—some—a great deal to think about. We've enjoyed your testimony. You may have been last on the schedule, but you were by far the most interesting of the witnesses. However dull people may perceive the whole question of insurance to be, you treated it in a very fascinating and stimulating way.

So we thank you for your patience. It is now well after 5 o'clock. It's been a long day for you.

Mr. VOLKMER. Could I ask a general, just a general question, to get back to insurance?

We had testimony from our first witnesses here, Deke Slayton and his people on the SPAS, and that's a new type of satellite.

Would they be able to get insurance on that before they've ever put one up?

Mr. HUGHES. The SPAS platform was insured.

Mr. VOLKMER. All right.

Mr. HUGHES. The basis of that insurance was—basically, you looked at the design—I will also say it was a very fundamental insurance policy. It's simply covering the fact that you could deploy it and recover it and bring it back down. It didn't have to work. It just had to get there and come back in one piece. Whether it did what it was supposed to when it got there was not a subject of insurance.

Mr. VOLKMER. Yeah, but what about the, you know, operational, in-orbit insurance, business interruptions, and stuff, with something new like that?

Mr. HUGHES. OK. The—if we're talking about, let's say, the development of a new remote-sensing spacecraft——

Mr. VOLKMER. Right.

Mr. HUGHES [continuing]. And the insurance of that, the process we would go through in determining its insurability—or actually the real question is not that it is insurable but, rather, will we insure it. It's a different issue. Anything's insurable for the right price.

We would take a hard look at the design. We would take a hard look at the pedigree of the components that have gone into that design. We would look at the structure and the redundancy within the design.

The other thing that would be a positive factor would be the utilization of shuttle, if we could fly shuttle into polar orbits for recovery and repair.

Another good aspect that shuttle would have on this is the possibility of in-orbit deployment and testing while tethered to shuttle to verify that it, indeed, worked.

So I think that a spacecraft that took into account the capabilities of shuttle would certainly be insurable, and any other spacecraft that's launched on an expendable, we would have to take a hard look at how it was designed.

Mr. VOLKMER. What are the major cost facts and elements in types of insurance you have? You have launch insurance?

Mr. HUGHES. That's the big one.

Mr. VOLKMER. That's the biggest one?

Mr. HUGHES. Oh, yeah.

Mr. VOLKMER. All right. And then third-party liability?

Mr. HUGHES. The cost for the third-party liability right now—the $500 million policy required for shuttle, I would say would cost users about $100,000, which is a small cost for that much coverage.

Mr. VOLKMER. In-orbit insurance?

Mr. HUGHES. That has tended to run in the range of 1 to 2 percent of the asset value per year.

Mr. VOLKMER. Business interruption?

Mr. HUGHES. That is typically the same kind—it's basically an extension of the terms of the in-orbit policy. So it's more or less built into there. It would just affect the limit of——

Mr. VOLKMER. If you had a whole package, including the launch, third-party liability, in-orbit, and business, would you say, then, launch would be over 50——

Mr. HUGHES. Oh, yes.

Mr. VOLKMER [continuing]. Percent of the total package or——

Mr. HUGHES. The launch cost initially is obviously a function of the launch vehicle and the pedigree of the spacecraft. But assuming both the spacecraft in orbit and launch rates will be the same effectively, it does become a major function of the launch vehicle. The expandable vehicle will be perhaps as much as twice that as the rate for shuttle. And the shuttle launch rate would be about 50 percent of the total insurance cost for the program.

Mr. VOLKMER. Then if you're using a Delta for a communication satellite——

Mr. HUGHES. Then probably you're taking that 50 percent and knocking the launch cost up to about 75 percent of the total insurance cost.

Mr. VOLKMER. Using an expendable will run it up about 75?

Mr. HUGHES. Yeah. That's off the top of my head, but I think that's about how it would work out.

Mr. VOLKMER. Thank you very much.

Mr. SCHEUER. Thank you very much, Mr. Hughes. We've enjoyed your testimony, and we appreciate your patience.

Mr. HUGHES. Thank you very much.

Mr. SCHEUER. The hearing is adjourned.

[Whereupon, at 5:15 p.m., the hearing adjourned.]

APPENDIX

ADDITIONAL MATERIAL SUBMITTED FOR THE RECORD

STATEMENT OF THOMAS B. STOEL, JR

DIRECTOR, NRDC INTERNATIONAL PROGRAM

BEFORE THE

SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS

AND THE

SUBCOMMITTEE ON NATURAL RESOURCES,
AGRICULTURAL RESEARCH AND ENVIRONMENT

HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY

This statement is submitted on behalf of the Natural Resources Defense Council (NRDC), by Thomas B. Stoel, Jr., Director of NRDC's International Program. NRDC is a nonprofit environmental protection organization which has more than 40,000 members in the United States and more than 20 other countries. Through its International Program, NRDC acts to promote environmental protection and wise use of natural resources on a worldwide basis. Remote sensing, if properly used, has great potential for achieving these goals. Accordingly, NRDC is very interested in the future use of these technologies.

I. The Need for Greater Use of Remote Sensing in Natural Resource Management

The world's natural resources are under increasing pressures, especially in the developing nations. The populations of these countries are growing rapidly, and are expected to increase by about 40% between now and the year 2000, when these nations will account for more than 75% of the population of the world. Under special stress are renewable resource systems. -- forests, soils, water, wetlands, fisheries -- on which these nations depend for food and other vital products. In the past, there has been a severe lack of data about the extent of resources, the rates at which they are being used, and the impact of their usage on essential ecological and climatic processes.

The development of remote sensing technologies has provided us with an extremely important tool for management of these resources. Through Landsat and other remote sensing techniques, we can now assess the status of these resources and determine whether they are being used sustainably.

For example, Landsat imagery provides the most cost-effective method for large-scale coverage of forest regions. Promising new satellite technologies such as the thematic mapper and imaging radar will greatly assist in the study of complex forest ecosystems. Landsat imagery is also extremely useful in determining the extent and rate of desertification, a serious problem in many nations and most publicized in the Sahel region

of Africa. The Environmental Research Institute of Michigan stated in 1980:

> Restored and edge-enhanced false color composite Landsat images provide the best data source for interpreting existing land use. Changing field patterns and decreasing vegetation cover are indications of changing environments and can be interpreted in terms of desertification processes.

Proper use of remote sensing as a tool for natural resource management would be of great benefit not only to developing nations but to the interests of the United States. We do not want to live perpetually in a world of beggars, dependent on us for food handouts and unable to purchase our goods. Moreover, exhaustion of natural resources will lead to political instabilities harmful to U.S. interests. It is no accident that Haiti and El Salvador are the Latin American nations where deforestation and other forms of resource depletion are most advanced.

The need for actions to make Landsat and other remote sensing technologies and data available to improve the management of renewable natural resources in developing nations has been recognized by agencies of our government and by international bodies. With respect to tropical forests, the U.S. Government's Interagency Task Force on Tropical Forests recommended in its May 1980 Report to the President:

> Recognized as a world leader in natural resource monitoring, the United States should have a special focus on this expertise within its tropical forest program. Particular

> U.S. strengths which can be brought to bear include remote sensing (both conventional and satellite). . . .

In 1977, the United Nations Conference on Desertification concluded that satellite observation should play a crucial role in surveying and monitoring the dynamics of desertification. Remote sensing is equally needed for other types of resource management, such as the assessment of soil conditions.

II. Recommended Actions

The United States should move swiftly and imaginatively to meet these crucial needs. If renewable natural resources are to be properly managed in the developing world, there is an urgent need for the best possible data on their status and use. Satellite data are frequently the best. When properly interpreted and made available to foreign governments, it can have great effects. For example, when presented with satellite photos showing accelerating deforestation, the Government of Thailand banned all log exports. When presented with similar data, the Government of the Philippines imposed draconian regulations to stem deforestation. In our own self-interest as well as that of the nations where the resources are located, we should make these data widely available.

Specifically, the Congress should direct the U.S. Government, perhaps through the Agency for International Development, to take the actions necessary to make available data

concerning renewable resources in developing countries in a form which is useful to decisionmakers and experts in those nations and elsewhere. This means that the U.S. Government should interpret the data and display them in a form which is readily understandable. These data should be made publicly available at nominal cost, so that individual experts and nongovernmental organizations will be able to use them.

The United States should seek financial and other support for these efforts from other developed nations which share our interest in natural resource management. The developing nations where the resources are located also should be asked to contribute. However, these nations include the poorest on earth, and it is precisely in the nations which least recognize the seriousness of the problem that these data may have the greatest impact. Therefore, we should provide the data free ourselves when necessary. The costs will be small in comparison with the payoffs.

There are other needs. The U.S. Government should remain free, under whatever commercialization scheme may be decided upon, to exchange remote sensing data with foreign governments. The Government should carry out, sponsor, and encourage research to discover and develop new remote sensing techniques for natural resource management. It should sponsor research utilizing remote sensing to discover improved methods of natural resource management which can enhance the habitability of our planet. And steps must be taken to ensure the continuity of Landsat data

after 1988.

III. Concerns About Commercialization

NRDC does not a this time take a position concerning the various proposals for commercialization. However, we do not see how commercialization will meet the needs just described, and it must not prevent us from taking the aggressive, imaginative actions required to do so.

The renewable resources in question are for the most part not exploited commercially, and when they are, that exploitation is often destructive of the resource base. In most cases, they are "common property" resources, are publicly owned, or are used for subsistence purposes. It is difficult to determine the monetary value of investments to ensure sound management of these resources. When a company invests in Landsat data and discovers oil, it can determine the value of those data. But what is the return from determining the rate of deforestation in Colombia or of desertification in Chad, and what individual or company will make that investment? To the extent that companies are willing to invest, they may be planning "cut and run" operations which are antithetical to sound resource mangement. One use of remote sensing data should be to regulate this kind of commercial exploitation in the public interest.

In short, investments to ensure sound management of these noncommercial resources must come mainly from governments. the nations involved are usually too poor to pay the full costs, and

often too poor to pay anything. Therefore, the responsibility falls upon the U.S. Government, as the proprietor of the technology.

In the interests of the United States, our Government should move swiftly to meet these needs, utilizing government agencies or private contractors as appropriate. We may be able to work out cost-sharing arrangements with some developing nations, with other developed nations which share an interest in sound resource management, and with international bodies. However, we should not attempt to avoid this important responsibility in the mistaken belief that commercialization will meet the need.

COMMERCIALIZATION OF LANDSAT AND THE WEATHER SATELLITES

ISSUE BRIEF NUMBER IB83072

AUTHOR:

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ISSUE DEFINITION

On Mar. 8, 1983, President Reagan announced his decision to transfer the civil land remote sensing system (Landsat), the civil weather satellite system, and future ocean observing systems to the private sector. This announcement raises many issues for the Congress including whether the land and/or weather satellites should be transferred, when and how this transfer should be made, and how to ensure the continuous flow of data from the U.S. remote sensing satellites. The initial congressional response to the proposed transfer has been somewhat negative with concerns being raised that the Administration is moving too fast and that the transfer may not be in the national interest.

BACKGROUND AND POLICY ANALYSIS

Landsat is a remote sensing satellite that returns spectral data in both visible and infrared wavelengths, which can then be processed into images and digital information. The first Landsat was launched by NASA in 1972. Landsat 4, the current operational satellite, was launched in July 1982. The final satellite planned in the series, Landsat D prime, has been built and is planned for a 1985 launch. Landsat 4 carries two sensors. The multispectral scanner (MSS) was one of two sensors carried on the three previous Landsats and is considered the operational sensor. It has an 80 meter resolution and returns data in 4 spectral wavelengths. The other sensor on Landsat 4 is the thematic mapper (TM) which is being flown for the first time and is still experimental. The TM is a more advanced sensor with a 30 meter resolution and returns data in 7 spectral wavelengths.

Operational responsibility for the MSS on Landsat 4 was transferred to the National Oceanic and Atmospheric Administration (NOAA) in the Department of Commerce on Jan. 31, 1983. The TM will remain under the National Aeronautics and Space Administration (NASA) until Jan. 31, 1985, when it will be considered operational and will be transferred to NOAA.

Landsat data are used by the Departments of Agriculture and Interior, the Agency for International Development, NASA, private industry, universities, and others in the government and private sector. Foreign governments also purchase Landsat data and there are ten ground receiving stations worldwide that receive Landsat data directly.

Issue brief 82066 -- Landsat (Earth Resources Satellite System) -- discusses Landsat in greater detail.

Civil Weather Satellites

There are currently four satellites in the civil weather satellite system which are operated by NOAA. Two polar orbiting satellites, NOAA-6 and NOAA-7, are in relatively low, near-polar orbits and provide whole-earth data for weather monitoring and prediction programs. These satellites collect global environmental data such as atmospheric soundings, sea surface temperatures, snow and ice flows, and day and night cloud distributions using four sensors. Two geostationary satellites, GOES-E and GOES-W, are in higher, equatorial orbits providing repetitive earth views for U.S. severe

weather warning services. These geostationary weather satellites each carry three sensors which return data in the infrared and visible spectrum to provide information such as cloud motion and wind, precipitation estimates, and frost monitoring.

The Federal Government uses 95% of the data from the civil weather satellites. The National Weather Service, in NOAA, is the primary user, providing weather information nationwide. The Department of Defense is the other major user; data from NOAA's polar orbiting satellites frequently supplements the Defense Meteorological Satellite Program (DMSP). The United States also has international agreements for the free exchange of weather data in which the U.S. gives out satellite data in exchange for foreign ground-based data.

Ocean Sensing Satellites

The U.S. launched an ocean sensing satellite, SEASAT, in June 1978. The satellite operated for less than four months before an electrical malfunction caused it to fail in orbit. Plans for NOSS, an ocean remote sensing satellite sponsored jointly by the Department of Commerce, the Navy, and NASA, were cancelled due to budget constraints. The Navy has shown an interest in developing its own ocean satellite, called N-NOSS, but no budget request has been forthcoming, and discussions are continuing between the three agencies. Future ocean sensing satellites were included in President Reagan's Mar. 8, 1983, announcement for transfer of U.S. civil remote sensing satellites, which may indicate that the Government does not plan to pursue such a program.

Policy Background

Landsat was developed as an experimental satellite system with no definitive plan on how to convert it to an operational system. Following years of debate in the Congress and the Administration, President Carter issued presidential directive 54 in 1979 which assigned the responsibility for an operational Landsat system to NOAA and also requested that NOAA consider private sector opportunities in civil land remote sensing activities with the goal of eventual transfer of Landsat to the private sector. The Carter Administration planned to build and launch Landsat 4 and three follow-on satellites which would have continued the Landsat program through 1994.

The Reagan Administration also supports the policy of transferring Landsat to the private sector, but within a shorter time period. The Reagan Administration plans to launch only one more Landsat, Landsat D prime, in 1985. Since each Landsat spacecraft has a life expectancy of 3 years, Landsat data will be transmitted through 1988. A lead-time of approximately four years is required to build and launch a satellite, so a follow-on to Landsat D prime would have to be initiated in 1984 in order to ensure program continuity.

On July 13, 1981, President Reagan assigned the Cabinet Council on Commerce and Trade (CCCT), chaired by Secretary of Commerce Malcolm Baldridge, the responsibility for assessing 1) the best mechanism for transferring Landsat to the private sector as soon as possible, and 2) if the weather satellites should be transferred at the same time. The CCCT met to discuss these issues in December 1981, and March and April 1982. According

to press reports, the Council decided at the April meeting that the weather satellites should remain under the control of the Federal Government and that more study was needed to decide what to do about Landsat.

In an effort to better understand the viability of commercializing Landsat, the Department of Commerce issued a request for information on Sept. 10, 1982, to solicit industry opinion. Twelve responses were received from industry and two from universities. The Secretary of Commerce assigned the task of reviewing the responses to the Land Remote Sensing Satellite Advisory Committee (LRSSAC). The LRSSAC, chaired by Michel Halbouty, is a group of individuals from non-Federal communities interested in civil remote sensing. On Nov. 19, 1982, the LRSSAC issued a report which emphasized the need for continuity in U.S. civil remote sensing satellite systems and recommended that the Government negotiate with private industry for the transfer of ownership of operation of the space and ground segments of land and/or weather satellites up to and including the receiving of raw unprocessed data, but not including value-added processing. According to NOAA, this recommendation would effectively prohibit the transfer of the remote sensing systems to a single private firm. There is, however, some disagreement on this conclusion resulting from the question of whether data pre-processing is included in the receiving of raw data, or if pre-processing is excluded along with value-added processing.

The Communications Satellite Corporation (COMSAT) was one of the respondents to the Department of Commerce RFI, and was the only one to recommend full commercialization of both land and weather satellites. COMSAT had first presented its plan for land and weather satellite commercialization to the Secretary of Commerce on Dec. 14, 1981. COMSAT believes that by combining the operations of the two systems it can operate both more efficiently and at a lower cost than the two are operated by the Federal Government. COMSAT estimates it can save the Government around $1 billion over a decade. Landsat alone does not have a sufficiently strong user market at the present time for a viable commercial venture, and COMSAT has argued that the guaranteed market for the weather satellites would be necessary to make commercialization profitable.

COMSAT has not made a formal proposal for the purchase of the land and weather satellite systems, but has outlined possible terms. These terms include the purchase of the existing civil remote sensing satellites systems for $250-350 million and a 15-year contract with the Government for the purchase of data at about $300 million per year. COMSAT assumes that the Government will continue to purchase and disseminate land and weather data.

Other respondants included such large private companies as Hughes, RCA, General Electric, and Control Data Corporation. Generally, the responses advised a gradual commercialization of Landsat over several years in order to allow the user market to develop. Some respondents expressed an interest in acquiring part of either the land or weather satellites systems. American Science and Technology, for example, expressed an interest in the acquiring the command and control segment of Landsat.

The Cabinet Council on Commerce and Trade met again on Dec. 15, 1982, reversed its previous decision, and recommended the transfer of civil land, weather, and future ocean remote sensing satellites to the private sector. The recommendation was then forwarded to President Reagan for approval. On Mar. 8, 1983, President Reagan announced his endorsement of the decision.

Administration's Tentative Transfer Schedule

The shortest legal time period during which a transfer could be implemented is one year. The complexity of the process, however, will probably draw the transfer out beyond that time period. The transfer will be carried out by a competitive process, conducted by the Department of Commerce, in which private firms will enter single bid for both systems. The transfer process begins with the formation of a source evaluation board. Three additional committees under that board will be formed for business and technical evaluations and for the drafting of legislation. The Department of Commerce will then begin to solicit industry input on the language for the formal request for proposals (RFP) which will include government-required terms and conditions and government data requirements. When the RFP is issued, it will include a 3-month turnaround time during which industry will be provided the information needed to make a proposal. Proposals will then be received for review and analysis. Legislation will be drafted and passed through the White House and submitted to the Congress. With congressional approval of the legislation, the satellite systems could then be transferred to the private sector.

Issues

Program continuity. Landsat has no strong user market and, at present, data sales are not large enough to meet Landsat procurement and operations costs. Users have been discouraged from making investments in equipment and training and from beginning long-range studies because of the uncertainty of continuous data availability. A long-term commitment to a user-oriented Landsat program is needed for a market to develop, according to many Landsat proponents.

Foreign competition. The French are planning to launch SPOT, a remote sensing satellite, in 1984. Japan is developing a remote sensing satellite for oil and mineral exploration, and the European Space Agency plans to launch an ocean resources satellite in the 1980s. Without a strong commitment to a future land remote sensing program, the U.S. could lose some of its foreign and domestic market for Landsat data to the French who are marketing vigorously and have strong government support behind the SPOT system. The U.S.S.R. collects remote sensing data from its manned space stations and its unmanned weather satellites but at present does not make this data available to other countries.

Concern over selection process. The transfer procedure which the President announced on Mar. 8, 1983, calls for a competitive selection process. At this point, only COMSAT has prepared a detailed plan for commercialization of land, weather, space, and ground segments and it is unclear whether enough other private companies will be interested to ensure a competitive bidding process.

Congressional input into the commercialization process. The Department of Commerce has stated that it fully intends to implement the transfer of Landsat and the weather satellites with legislation passed through the Congress. There has been concern, however, that the Administration has, in effect, already made its decision and that Congress will not have sufficient voice in the many issues involved in the commercialization. Legislation has been introduced to require congressional approval before any transfer takes place since it is unclear whether the Administration could implement the transfer without legislation. Because of the large number of congressional

committees with jurisdiction over matters relating to the transfer, prompt congressional approval is unlikely if indeed the transfer is approved at all.

Other Issues. There are many other issues which have been raised concerning the commercialization of Landsat and the civil weather satellites. These include :

-- How much does it cost the Federal Government to operate the land and weather satellite systems?

-- What would be the possible consequences of the failure of a commercialized land or weather satellite program and how would the Government respond? Would it cost the Government more to buy back into the system after such a failure?

-- What are the national security requirements and implications for both land and weather satellite systems?

-- How will the U.S. "open skies" policy, which has allowed all nations to acquire data under equal terms, be affected?

-- Who has responsibility for continuing high-risk research and development in remote sensing to ensure that the U.S. systems remain competitive on the world market?

-- How would a private enterprise continue international cooperation in land and weather remote sensing? How would this effect U.S. relations with developing countries who have been receiving Landsat data?

These issues will have to be dealt with during a transfer of all or part of the U.S. civil remote sensing satellites to the private sector.

Congressional

An informal Landsat Liaison Group has been formed including individuals from congressional offices, the Departments of Commerce and Agriculture, the Office of Technology Assessment, the General Accounting Office, the Congressional Research Service, and others who are working on the commercialization issue. Briefings have been held on the Landsat system, commercialization, and on COMSAT's plan for commercialization. Radford Byerly of the House Science and Technology, Subcommittee on Space, is the contact point.

The House and Senate held combined hearings on civil land remote sensing on July 22 and 23, 1981. The House Science and Technology Committee issued a report on its finding in April 1982. Hearings on the commercialization of the land, weather, and future ocean remote sensing satellites are anticipated in the 98th Congress.

In addition, there have been a number of Congressional Record inserts relating to the transfer. Among these are:

Statement by Rep. J.J. Pickle on the possible hidden costs of the COMSAT plan through accelerated cost recovery and investment tax credits leading to Federal revenue losses. Mar. 18, 1983, H1388.

Statement by Rep. Timothy Wirth on public services provided by weather and land remote sensing satellites. Mar. 11, 1983, E995.

Statement by Rep. Roy Dyson accompanying H.R. 1958 on the need for congressional input on commercialization issue. Mar. 8, 1983, E877.

Statement by Sen. Larry Pressler accompanying S. 480 on concerns about commercialization of remote sensing satellites. Feb. 15, 1983, S. 1165.

LEGISLATION

98th Congress

P.L. 98-8, H.R. 1718

Emergency Jobs Bill. Passed House Mar. 3, 1983. Senate Amendment 47 (Huddleston) requiring congressional approval of transfer, lease, or sale of civil operational remote sensing satellites passed Senate Mar. 15, 1983. H.R. 1718 passed Senate Mar. 17, 1983. Referred to conference Mar. 17, 1983. Amendment transformed into a Sense of the Congress provision. Conference report filed March 21 (H. Rept. 98-44). Signed into law Mar. 25, 1983.

H.R. 2065 (Fuqua)

Authorizes NASA appropriations for FY84. Title II amendment requires that Congress be notified of any plan to transfer civil land, meteorological, or ocean remote sensing satellite system to the private sector and such a transfer be approved by law. Referred to House Committee on Science and Technology Mar. 11, 1983.

S. 480 (Pressler)/H.R. 1958 (Dyson)

Requires congressional approval of the transfer of civil land and weather remote sensing satellites systems to the private sector. Introduced in the Senate Feb. 15, 1983; referred to the Committee on Commerce. Introduced in the House Mar. 8, 1983; referred to the Committee on Science and Technology.

97th Congress

P.L. 97-324, H.R. 5890

Authorizes NASA appropriations for FY83 and provides authority for the Secretary of Commerce to manage and operate Landsat and conduct studies on the future transfer to the private sector. Reported from Science and Technology Committee May 5, 1982 (H. Rept. 97-502); passed House May 13. Senate Commerce, Science and Transportation Committee reported the bill May 28, 1982 (S. Rept. 97-449); passed Senate June 9. Conference report issued Sept. 29, 1982 (H. Rept. 97-897). Signed into law Oct. 15, 1982.

S. 2767 (Cannon)

Land Remote Sensing Satellite Authroization Act of 1982. Provides mechanisms for transferring Landsat to the private sector. Introduced July 22, 1982; referred to Committee on Commerce, Science, and Transportation.

TRANSFER OF THE

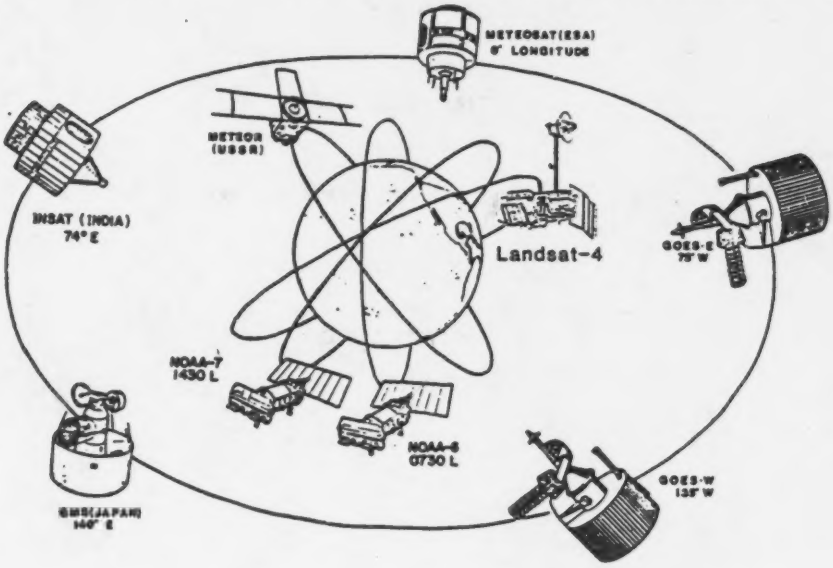
CIVIL OPERATIONAL EARTH OBSERVATION SATELLITES

TO THE

PRIVATE SECTOR

February 1983

OPERATIONAL EARTH OBSERVATION SATELLITES



PREFACE

The Congress has directed the Secretary of Commerce to conduct a study of a number of aspects of transferring civil operational land remote sensing satellite systems to the private sector. As stated in Public Law 97-324,

> . . . the Secretary shall --
>
> (A) Conduct a study to define the current, projected, and potential needs of the Government for land remote sensing data.
>
> (B) Determine and describe the equipment, software, and data inventory that could be transferred to the private sector.
>
> (C) Compare various feasible financial and organizational approaches for such a transfer. Criteria for the comparison should include considerations such as: maintenance of data continuity; maintenance of United States leadership; national security; international obligations; potential for market growth; marketing ability; sunk and projected cost to the Government; independence of subsidy or financial guarantee from the Government; potential of financial return to the Government; and price of data to users. The following institutional alternatives should be compared: (i) wholly private ownership and operation of the system by an entity competitively selected; (ii) phased-in Government/private ownership and operation; (iii) a legislatively chartered privately-owned corporation; and (iv) continued ownership and operation by the Federal Government. The Secretary shall complete these studies and report on them to the Congress by February 1, 1983.

The following report provides the results of the study. The Congress requested a study addressing only the land satellites, but the Administration has been examining private sector transfer of the land and weather satellites. Therefore, in order to be responsive to the anticipated needs of Congress, the scope of the report has been expanded to include the companion material on the environmental or weather and future ocean satellites as well.

Public Law 97-324 also mandates that parallel studies be carried out by industry. Those studies are in progress and will be submitted by the April 1, 1983 date stated in the law.

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I. INTRODUCTION

Some of the most spectacular images produced by the early space program were not pictures of distant celestial objects, but of our own planet. Early astronauts returned pictures taken with simple hand-held cameras that provided both new insights into terrestrial phenomena as well as the inspiration for the Earth-observation systems to follow.*

The systems stemming from these early insights have included experimental and operational environmental (weather) satellites, experimental satellites to study the Earth's resources, and an experimental ocean satellite. Today, two polar-orbiting weather satellites monitor weather and surface conditions over the entire globe from pole to pole. Two geostationary weather satellites observe, respectively, the Atlantic Ocean and East and Gulf Coasts and the Pacific Ocean and West Coast. A single Earth resources satellite, usually called Landsat, is in low-altitude polar orbit. These United States systems are complemented by a number of foreign earth-observations satellites.

The most noticeable features of the early space photographs were the dramatic large-scale cloud patterns. They gave immediate encouragement to the on-going speculations about the potential value of satellites to weather forecasting. The satellite weather observing system that has evolved from those speculations is described in detail in Appendix A of this report.

The early photographs from space also showed that, if one looked beyond the cloud formations, other interesting terrestrial features were clearly visible as well. The features included cities, agricultural areas, river basins, mountain ranges, and other geological formations. The study of these features has applications in mineral and petroleum exploration, hydrology and flood control, land use

* Oran W. Nicks (ed.), This Island Earth, NASA SP-250, Wash., DC (1970).

planning, rangeland and forest management, and agricultural productivity assessments.

Samples of Landsat images and discussions of their applications are available in a number of readily accessible books, but Charles Sheffield's artistic book* and Floyd Sabin's lucid textbook** are superb starting points for further study. The latter half of Appendix A of this report provides a discussion of the current Landsat system. The discussion in Appendix A is intended to meet the Congressional requirement for a description of the equipment, software, and data inventory that could be transferred to the private sector (item (B) listed in the Preface).

Not only were weather and land phenomena found to be observable from space, but ocean phenomena proved to be equally amenable to successful measurement from space. A dedicated U.S. ocean satellite, called Seasat, and instruments carried on operational and experimental satellites of NASA and NOAA have provided convincing evidence of the utility of these measurements.***

A question of concern to many people is, "What is the future of these systems?" Should such systems remain within the Federal Government, or should they be transferred to the private sector in a distant analogy to the actions taken on communications satellites in 1962?

When an operational program is carried out within the Federal Government, policy guidelines of all recent Administrations require that the activity be periodically reviewed to determine whether or not it could be more effectively carried out by the private sector.

Further, when a research program produces something of value, responsible management quickly asks how it can be transferred from the research environment to beneficial use. This is true of all research programs, whether public or private. The ease with which the transition can be effected is influenced by many factors including: market readiness, extent, and aggregation; level of initial capital investment needed; state of understanding of the underlying science base; and the state of development of the required technology.

The weather, land, and ocean satellites are all at different stages in the evolution from research to operational application. The

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* Charles Sheffield, Earth Watch, Macmillan, New York (1981).

** Floyd F. Sabins, Jr., Remote Sensing, Freeman, San Francisco (1978).

*** J. F. R. Gower (ed.), Oceanography from Space, Plenum, New York (1980).

weather satellites are furthest along in the transition. Their technology is largely understood. The classes of measurements that have the greatest utility are well understood. In some instances, the organization using the measurements, the National Weather Service, requires more experience with the use of particular measurements, but the process of transition is well along. The weather satellites serve a naturally aggregated market -- the Government.

The Landsats are at an earlier state of understanding, technology development, and utilization. Their user community is not aggregated, and commitments to operational use of their data have been slow in coming. One reason is the inherent inability of a Government entity to develop markets. Thus, when one examines the data market for the Landsat system, there is a degree of uncertainty that must be accepted. Appendix B provides the information on present markets. This includes the material satisfying the requirement for a listing of Federal data needs (item (A) in the Preface). Independent analyses were also directed by the Congress and are being conducted by ECON, Earthsat Corp., and the National Academy of Public Administration.

A further uncertainty concerning the Landsats is the underlying base of knowledge that permits one to state what combination of sensor parameters or mixture of sensors will produce the most favorable system design. This base is being driven by current advanced research projects rather than the private sector's needs, yet many more such projects will be required in the future. Even ten years of experience with Landsat have left many questions unanswered. The expectation that many changes and improvements will be necessary must be an integral part of the planning for an operational system.

Ocean satellites share some of the characteristics of both the weather and land satellites. A recent report stated:*

> Global information about the oceans has huge potential economic value for: (a) ship operations, by permitting fuel savings

* National Advisory Committee on Oceans and Atmosphere, Position Paper on Ocean Satellites, 27 October 1982.

through improved knowledge of changing ocean, weather, and ice condition; (b) fishery management, by supplying important oceanic environmental data and information about biological productivity; (c) offshore oil, gas, and mineral development, by providing developers with knowledge of sea and weather conditions necessary for safe and economical operations; and (d) weather forecasting, by providing basic data about sea surface and atmospheric conditions necessary to improve national and international forecasts.

One of the most important characteristics shared between weather and ocean satellites is the need for continuing global observation of a rapidly changing medium whose changes have important human and economic effects. This leads both weather and ocean systems to require frequent or continuous coverage of essentially the entire Earth, and necessitates a capability for rapid world-wide data dissemination. These commonalities suggest that weather and ocean sensing capabilities could be merged in the future.

The next chapter provides the analysis of private sector transfer options required by Congress, and a discussion of the Administration's decision.

II. PRIVATE SECTOR TRANSFER OPTIONS AND OVERSIGHT STRUCTURE

A. Introduction

Greater private sector involvement is desired by the Administration for a number of reasons:

- o Eventual reduction of the Federal responsibility in providing funding for civil space remote sensing.
- o Reduction in the size and scope of Federal activities and expansion of the private sector economic base of the country.
- o Mobilization of private sector forces to expand the market for space remote sensing data.

A number of private entities have expressed interest in assuming responsibility for the civil space remote sensing systems both land and weather.

All agencies believe that self-supporting, successful private markets could evolve for land and weather satellite data. The Government provides a steady market for weather data. The market for ocean data appears certain, even though only experimental systems have flown to date. The market for land satellite data is growing. The land satellite data market has not grown as rapidly as it could have because of the inherent limitations on the Government in developing domestic and international markets. Thus, the long-term outlook appears extremely good--provided an aggressive private sector is given the opportunity to develop and expand the market base for this product.

Foreign governments have recognized the value of this technology. Civil space remote sensing systems are being advanced by France, Japan, the European Space Agency, India, Canada, the Federal Republic of Germany, and the Soviet Union. Table II-1 lists the current foreign initiatives in civil space remote sensing. To date, France has actually invested in a land remote sensing system (SPOT); others have interest only in weather systems.

The already purchased Landsat D and D' are expected to last until 1988. Current policy for land remote sensing is to continue operating these satellites until they fail, unless private industry is willing to take them over sooner. Thus, the budget has only funds for operating costs and does not include additional Federal funding to procure additional land satellites. The budget assumes that any future land remote sensing systems would have to be developed, launched and operated by a private entity. Some U.S. private firms have expressed interest in entering this field.

Table II-1A

PLANNED FOREIGN LAND, METEOROLOGICAL, AND OCEAN SATELLITE MISSIONS

COUNTRY	MISSION	LAUNCH	STATUS	OBJECTIVES	SIGNIFICANT CAPABILITIES
FRANCE	SPOT	1984	FUNDED	LAND	STEREO SOLID-STATE SENSORS 20M MULTISPECTRAL/10M PANCHROMATIC RESOLUTION
JAPAN	MOS	1986	FUNDED	OCEAN/LIMITED LAND	SOLID-STATE SENSORS
	ERS	1989	SENSOR STUDIES FUNDED	OCEAN	SYNTHETIC APERTURE RADAR SOLID-STATE SENSORS
	GMS	1985	APPROVED	METEOROLOGY	VISIBLE & INFRARED SCANNER, WEFAX & DATA COLLECTION SYSTEM
ESA	ERS	1988	APPROVED PHASE-B	OCEAN/LIMITED LAND	SYNTHETIC APERTURE RADAR SCATTEROMETER ALTIMETER
	METEOSAT	1985	APPROVED	METEOROLOGY	VISIBLE & INFRARED SCANNER, WEFAX & DATA COLLECTION SYSTEM

Table II-1B

PLANNED FOREIGN LAND, METEOROLOGICAL, AND OCEAN SATELLITE MISSIONS

COUNTRY	MISSION	LAUNCH	STATUS	OBJECTIVES	SIGNIFICANT CAPABILITIES
USSR	GOMS	1984	FUNDED	METEOROLOGY	VISIBLE & INFRARED SCANNER, WEFAX & DATA COLLECTION SYSTEM
	METEOR	-	FUNDED	METEOROLOGY	VISIBLE & INFRARED SCANNER
INDIA	IRS	1985	FUNDED	LAND	SOLID-STATE SENSORS
	INSAT-1B	1983	FUNDED	METEOROLOGY	VISIBLE & INFRARED SCANNER DATA COLLECTION SYSTEM
CANADA	RADARSAT	1989	PHASE-A/B APPROVED	OCEAN/LAND	SYNTHETIC APERTURE RADAR
GERMANY	MOMS	4/1983 SHUTTLE FLIGHT	FUNDED	LAND	MODULAR, SOLID-STATE SENSOR
	MRSE	9/1983 SPACELAB FLIGHT	FUNDED	LAND	LIMITED SYNTHETIC APERTURE RADAR

This report compares various financial and organization approaches for a transfer of remote sensing systems to the private sector.

In the following sections, the four options stated in Public Law 97-324 will be examined. They are:

- o Wholly private ownership and operation of the system by an entity(ies) competitively selected,
- o Phased-in Government/private ownership and operation,
- o A legislatively chartered privately-owned corporation,
- o Continued ownership and operation by the Federal Government.

The criteria to be used in studying the options are:

- o Maintenance of data continuity,
- o Maintenance of United States leadership,
- o National security,
- o International obligations,
- o Potential for market growth,
- o Marketing ability,
- o Sunk and projected cost to the Government,
- o Independence of subsidy or financial guarantee from the Government,
- o Potential of financial return to the Government, and
- o Price of data to users.

The Federal oversight structure is described after the options have been reviewed.

Options 1, 2, and 3 include the transfer to the private sector of Landsat and possible transfers of the current civil meteorological and future civil operational ocean satellite systems. The latter are included because of the current review within the Administration of the desirability to transfer all operational civil satellite systems to the private sector.

B. Option 1 - Wholly Private Ownership and Operation of the System by an Entity(ies) Competitively Selected

The following discussion assumes that one or more entities are selected to own and operate the civil operational weather, land, and future ocean satellites. Plausible combinations might be the land or weather and ocean satellites separately, combine any mix thereof, or any part of a single system. The attractiveness of a single system could stem from economies of scale, if demonstrable, that could produce savings in the high cost system elements.

In this option, private entity(ies) could be selected to own and operate the system and the arrangement could have the following attributes:

- o A private entity(ies) would be selected through a competitive process to own and operate the system(s).
- o The private entity(ies) is totally responsible for managing the system.
- o The capital needed to develop and build the system would be provided through private equity, private debt investments, and/or retained earnings.
- o Allows the greatest range of competition.
- o Federal interests could require a continuing oversight of private entity(ies) involved in civil space remote sensing, as outlined by existing international law, national law and current national space policy.

The advantages and disadvantages of Option 1 are given below:

Advantages:

- o Allow the greatest range of competition.
- o Maintains program in all areas of civil space remote sensing.
- o Demonstrates commitment to the U.S. private sector role in space.
- o Reduces the size and scope of Government activities.
- o Stimulates technology development by the private sector in response to market demands and expands the role of private industry.
- o Would achieve private sector ownership at earliest possible time.
- o Could place some of the financial risks in the private sector.
- o Would provide a strong profit incentive for vigorous market development and system efficiency.
- o Would be more responsive to market demands than the Federal Government.

Disadvantages:

- o May require increased Federal funding to cover minimum purchase commitments by the Government until the private entity(ies) is established.

Discussion: The following discussion employs the criteria listed on page II-4 as topic headings.

Maintenance of Data Continuity: The continuity of weather satellite data rests upon the satellites currently under manufacture. A private entity(ies) would assume ownership of those assets and initiate procurement of follow-on satellites. Because it is only a matter of timing the assumption of ownership and control, no issue of data continuity arises.

The situation could be different for the Landsat type satellites. The present Landsat-4 satellite is planned to operate until 1985. A replacement satellite, Landsat-D', will be completed in 1983 and placed in storage. After failure of Landsat-4, it will be launched and, if that occurs in 1985, is planned to operate until 1988. If Landsat type data continuity is to be assured, a private-sector satellite must be available for launch at that time. Three to four years is a typical duration for satellite manufacture, so a start in 1984-1985 would be necessary for Landsat type data continuity. Obviously this is true for all options, but this option may permit that starting date to be achieved more readily than the others that follow.

Maintenance of United States Leadership: The United States is not alone in civil space earth observations. The French have invested in a land remote sensing system..SPOT. Some argue that the United States has created this high-technology field, but it could lose its leadership position in land remote sensing unless the Landsat follow-on is internationally competitive. Although proponents of Landsat type data view this possibility with alarm, there is considerable debate about the importance of preserving the United States lead for civil land remote sensing. It should be noted, though, that the U.S. Government holds such preeminence in remote sensing technology (with NASA and DOD's continued support of advance R&D remote sensing systems) that it is hard to believe that a U.S. private industry could not maintain its leadership position.

National Security and International Obligations: Contractual provisions between the Government and the data supplier, will assure that national defense, intelligence, and foreign relations concerns are satisfied.

Market Growth and Ability: This option provides the greatest encouragement and incentives for a private vendor to expand the market for satellite data products.

Cost and Subsidies: The costs/benefits and subsidies associated with the commercializaton of the civil remote sensing systems cannot be determined until an RFP is issued and bids are evaluated. At that point, the U.S. Government can decide if commercialization is desirable.

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Financial Return to the Government: In a competitive process, a private entity(ies) could elect to buy the satellites or the Federal Government could auction the satellite assets. The financial return to the Government would be the amount that the private entity(ies) is willing to pay for the satellite assets.

Under other scenarios, the financial return would be the difference between the cost to the Federal Government to provide its own minimum data requirements versus the cost to the Federal Government to purchase the minimum data requirements from a private entity(ies). If it cost the Federal Government more to buy the data from industry, then a data purchase contract could be structured under this option that would provide a sliding scale dependent upon the growth of the private market. The scale could apply to the data purchase price, the extent of guaranteed market, or both. The exact financial return to the Government must await further negotiations with the private industry.

Price of Data to Users: Users have benefitted from Government support of a Federal system. They have not been required to pay for the data at a rate that would generate sufficient revenue to amortize the total system costs. Where specialized products are developed for identifiable and directly benefitting user communities, it must be expected that those users' costs may rise. In the longer term, they too will benefit from the market expansion foreseen under private sector operation.

C. Option 2 - A Legislatively Chartered Privately Owned Corporation

There are different ways to establish a legislatively chartered privately owned corporation. The following is one example and by no means is this the only efficient way of establishing such a corporation.

The Federal Government, through legislation, could establish a for-profit private corporation to own and operate all or a part of the U.S. civil remote sensing satellite systems. The corporation could have the following attributes:

- Federal and non-Federal representation could be provided on its Board of Directors.
- The capital needed to develop and operate the system could be provided through the sale of capital stock and debt obligations in the private financial market or through the Federal Financing Bank and the Department of the Treasury. If all the corporation's stock were not purchased on the private market within a predetermined period, the enabling statute could provide for government purchase of unsold stock or for the withdrawal of the stock offering and use of another option.

- Stock ownership by private corporations active in the aerospace, data processing, and value-added service fields could be limited to a specific percentage of the corporation's stock.

- A portion of the corporation's revenue could be provided through a long-term Federal service contract guaranteeing purchase of the standard data products required to meet the Federal Government's needs.

- The corporation could assume the risk of recovering the remaining percentage of its capital and operating costs, plus a profit, through an aggressive market development program.

- The corporation could be precluded from itself building the space and ground segments and could be required to procure its hardware and software through a competitive bidding process.

- The corporation could be regulated by the Government to ensure compliance with U.S. national and international policies. The statute also could provide for periodic review of the corporation's affairs.

The advantages and disadvantages of Option 2 are given below:

Advantages:

- Maintains a program in all areas of civil space remote sensing.

- Demonstrates commitment to the U.S. private sector role in space.

- Could stimulate technology development by the private sector in response to market demands.

- Would spread financial risks among private investors, private lenders, and the Federal Government.

- Would be more responsive to market demands than the Federal Government.

Disadvantages:

- May require increased Federal funding to cover minimum purchase commitments by the Government, until the private entity is firmly established.

- o Minimally reduces the size and scope of Government activities.
- o Would achieve private ownership at an early time, although not as soon as Option 1.
- o Federal subsidies/guarantees could mask important economic signals which would indicate what system(s) should be developed by private industry.
- o Establishing a legislatively chartered privately owned corporation would limit the Government to purchase its data requirements from one entity.
- o Once the corporation is established, the Federal Government might be committed to its continued support for an indefinite period of time if it turned out to be unsuccessful financially.
- o The protected environment of the corporation may make it less aggressive in market development than the firm in Option 1.
- o Would create a statutory monopoly, limiting the entry into the market by other private firms for the foreseeable future.

Discussion: This option shares some of the characteristics of Option 1. Its principal distinction with Option 1 is the large Federal influence on the activities of the corporation.

Maintenance of Data Continuity: The discussion under Option 1 applies here with one modification. It was noted that work must begin in 1984-1985 time frame on a follow-on satellite to Landsat-D'. This option would require more time to implement than Option 1 because of the added steps in establishing the legislatively chartered corporation.

Maintenance of United States Leadership: The discussion under Option 1 applies.

National Security and International Obligations: The discussion under Option 1 applies.

Market Growth and Ability: While the option provides encouragement and incentives for a private entity to expand the market for satelite data products, the entities would not react to market forces like in Option 1. To the extent this is true, the private entity(ies) may be less aggressive in market remote sensing development.

Cost and Subsidies: The discussion under Option 1 applies. The one point of difference is the legislatively chartered corporation may be less aggressive. Should subsidies be needed this would affect the rate at which subsidies could be reduced or terminated.

Financial Return to the Government: The discussion under Option 1 applies, with the above caveat concerning the vigor of market development activities.

Price of Data to Users: Again the Option 1 discussion in this area is appropriate here.

D. Option 3 - Phased-In Government/Private Ownership and Operation

As in Option 2, there are different ways to phase-in Government/private ownership and operation. The following is just one example of how this could be accomplished.

The present role of the private sector is shown in Figure II-1. Under the present circumstances, the private sector role--excluding functions carried out on behalf of the Government under Government control--is largely the developing, marketing, and delivery of specialized data products.

A first step in expanding the private sector role could be to transfer all value-added processing to the private sector. This is shown in Figure II-2. After a secure business base is developed, predicated upon a Government-assured supply of preprocessed data, the function of preprocessing raw satellite data can be transferred as shown in Figure II-3. It should also be noted that an increasing role in product development and research is shown as well.

After a secure business base exists, relying upon a Government-assured stream of raw data, the private sector's role would be expanded to include the high-cost system elements. At this point the final configuration would be achieved, as shown in Figure II-4.

Thus, the Federal Government would gradually--in stages--withdraw from operational civil space remote sensing as the market for data products develops. The approach would have the following attributes:

- Phasing of the transfer of system elements would be under Federal control.
- Funding for the system would be initially through normal Federal appropriations. The required appropriations would decrease with the success of market expansion.
- The risk assumption by the private sector would be minimal and gradual.

FIGURE II-1: DEPICTION OF PRESENT PRIVATE SECTOR ROLE

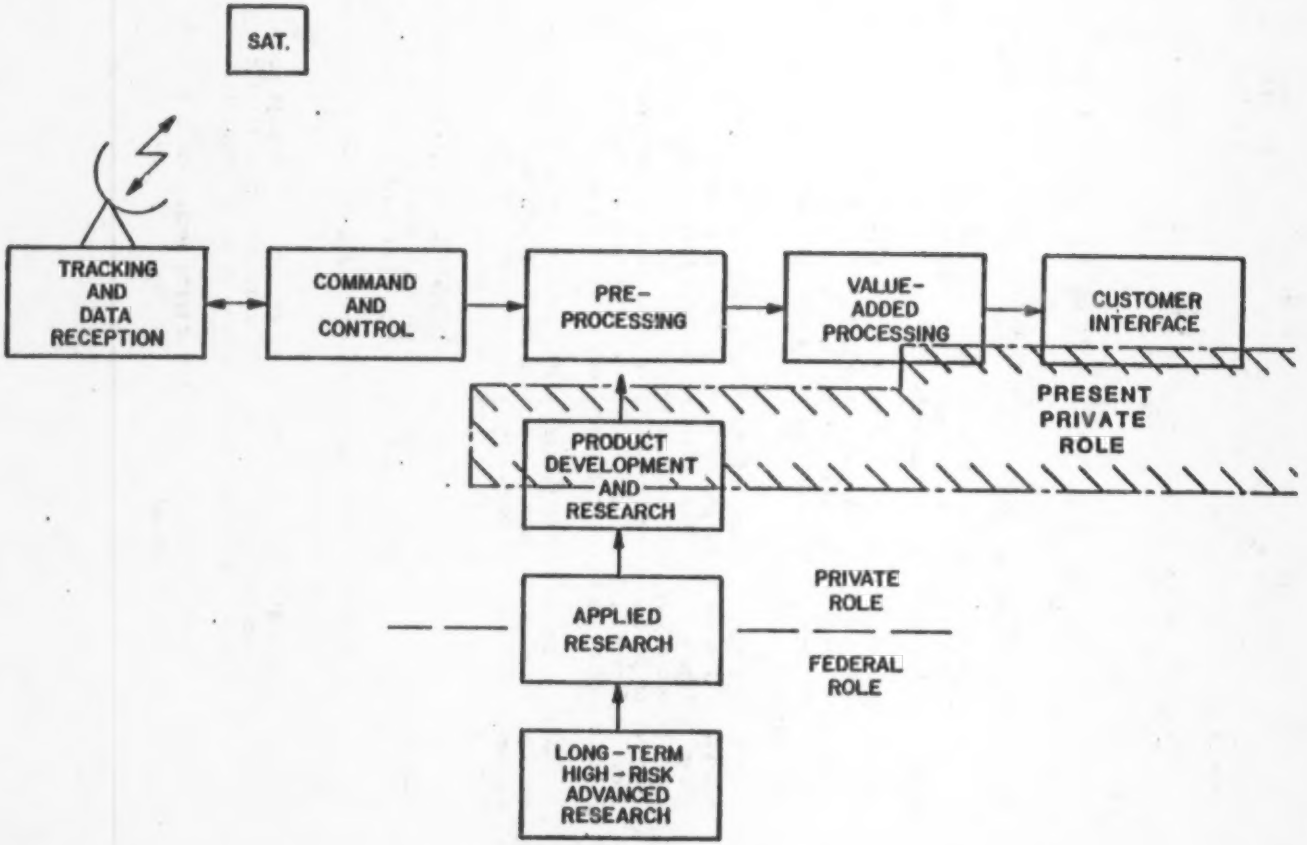

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FIGURE II-2: EXPANSION OF PRIVATE SECTOR ROLE TO INCLUDE RESPONSIBILITY FOR VALUE-ADDED PROCESSING

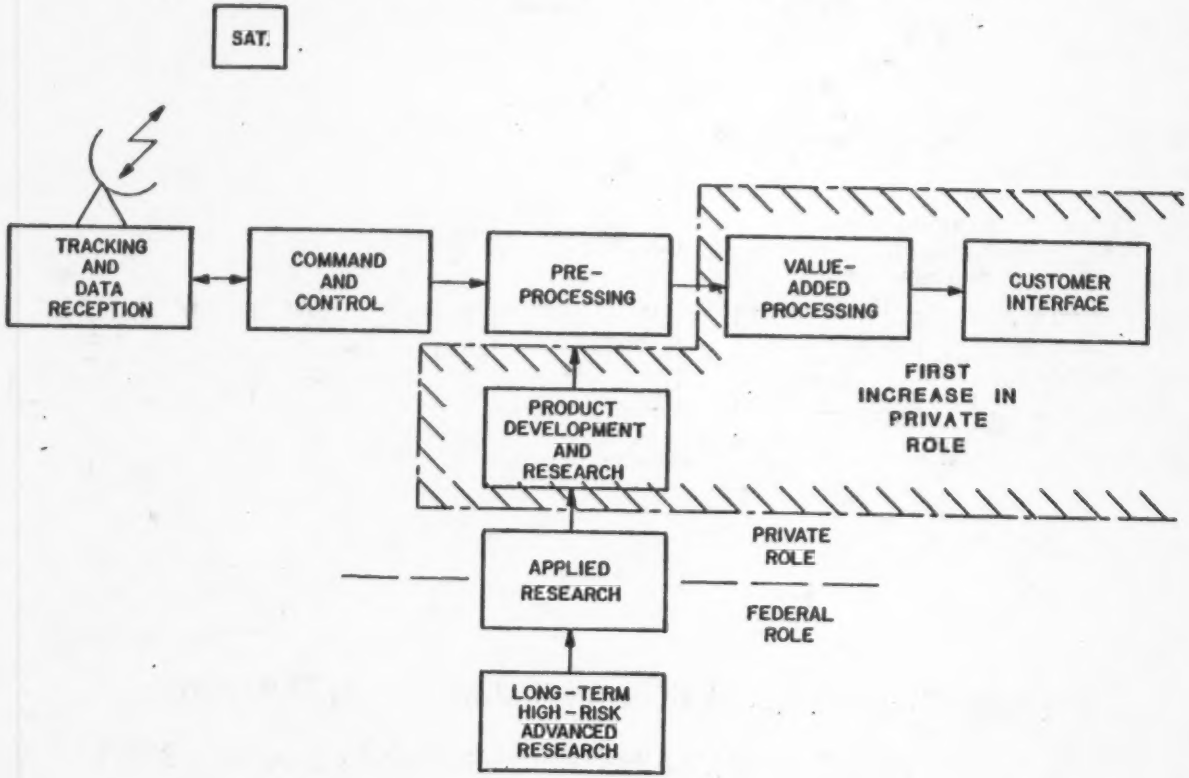

FIGURE II-3: EXPANSION OF PRIVATE SECTOR ROLE TO INCLUDE RESPONSIBILITY FOR PREPROCESSING

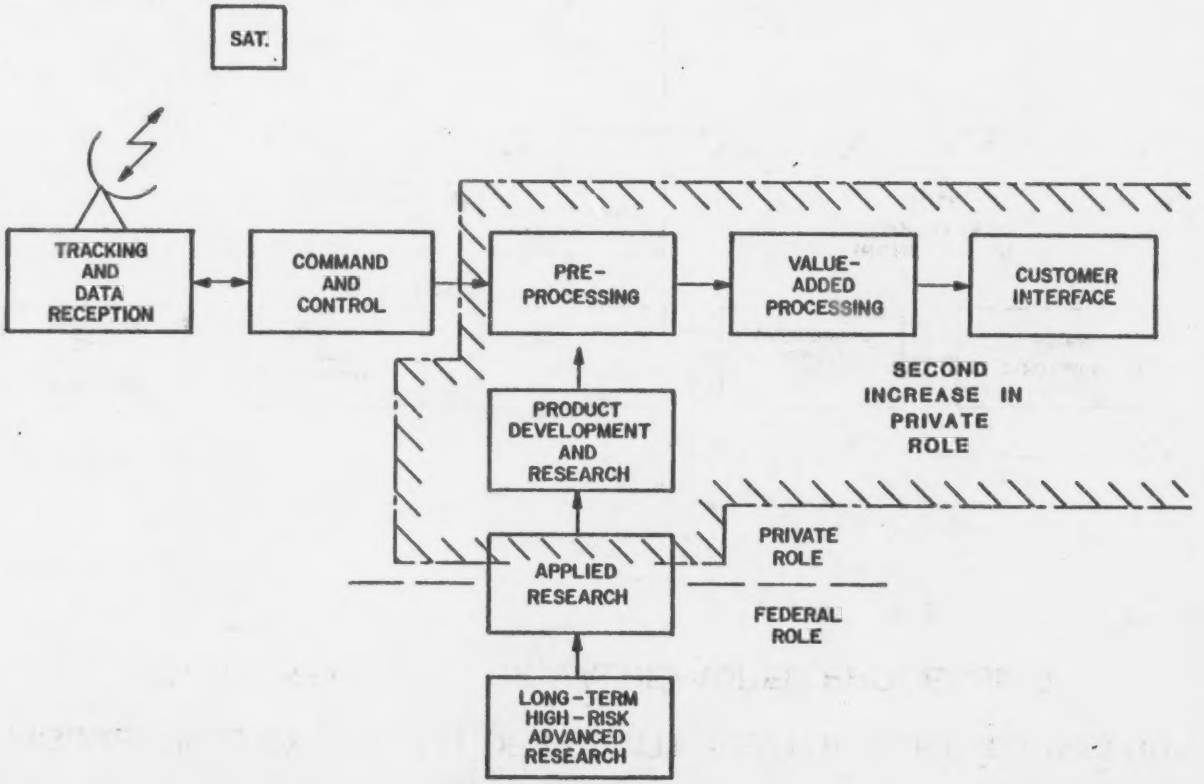

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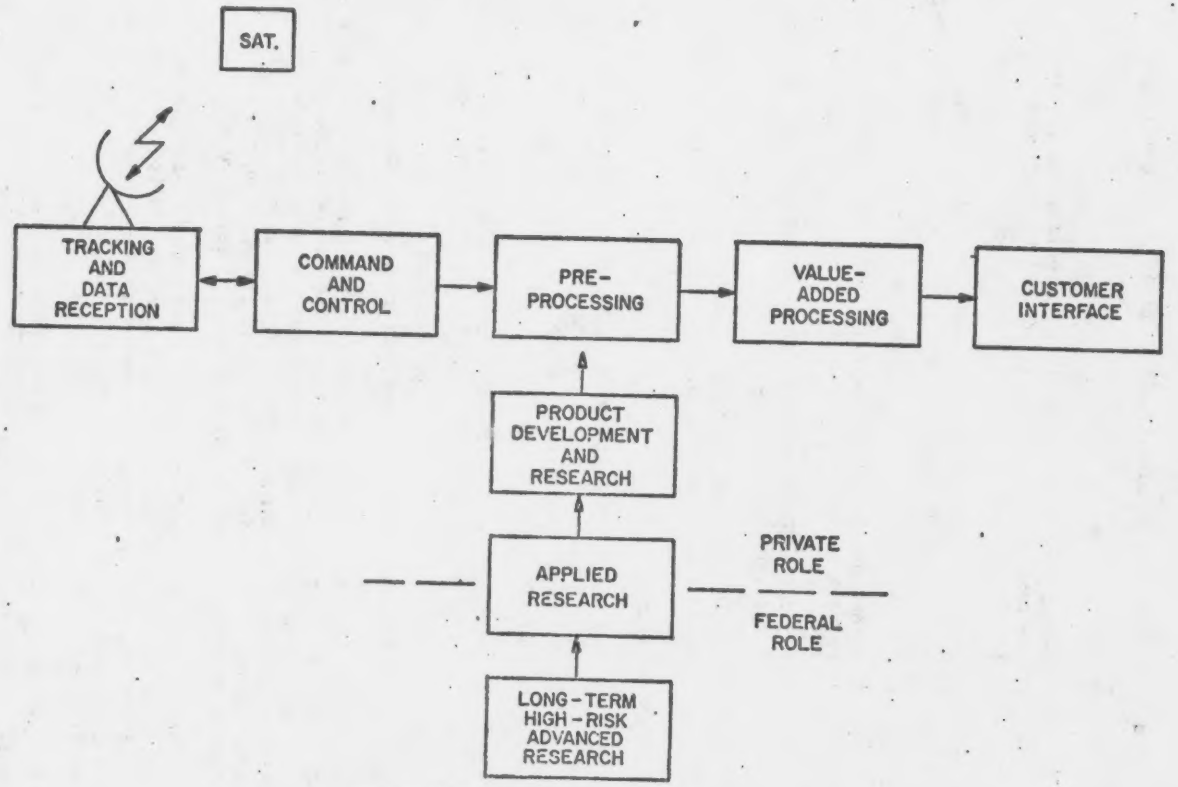
FIGURE II-4: FINAL CONFIGURATION AFTER PHASED TRANSFER IS COMPLETE



REPRODUCED AT U.S. GOVERNMENT EXPENSE

The advantages and disadvantages of Option 3 are given below:

Advantages:

- o Maintains a program in civil space land remote sensing if additional funds are provided for the construction of satellites beyond Landsat-D'.
- o Gradually reduces the size and scope of Government activities, but over a much longer period than the first two options.
- o Allows phased assumption of system capitalization by the private sector.
- o May allow the greatest range of competition in the early stages of commercialization.
- o Concerns related to foreign policy and national security matters could be addressed on a gradual basis.

Disadvantages

- o Not within current budget. Increases budget risks in future years. Requires immediate funding for one or more follow-on Landsats to ensure data continuity, for market development.
- o Does not easily provide a natural incentive for the private sector to assume responsibility for high cost segment of system.
- o Transfer to the private sector is protracted.

Discussion: The characteristics of this option are obviously much different than the preceding ones. The Federal presence is large in the early years, and indeed, there would be many barriers, some recurring annually, to the withdrawal of the support. The Federal Government would also have the responsibility of doing the initial market development. This is not an inherent Federal role.

Maintenance of Data Continuity: The Federal Government would have to provide a firm commitment to ensure the availability of data to support the private firms. The evolution would occur over a longer period of time and would be guided by the economic and political realities during that time.

National Security and International Obligations: This option largely eliminates concerns in these areas because of the close Federal involvement throughout the transition process.

Market Growth and Ability: Market growth would be slow since the Federal Government not the private sector would have to do the initial market development. Future growth rests with the firms who would begin providing data products and services.

Cost and Subsidies: The Federal Government would provide all funding for the high-cost system elements for a considerable period.

Financial Return to the Government: Agreements could be negotiated to provide a financial return to the Government from the elements successfully transitioned.

Price of Data to Users: The price could start low, but the necessity to eventually capitalize the entire system could lead to the same situation as in the first two options.

E. Option 4 - Continued Ownership and Operation by the Federal Government

This would continue the current budget policy of transferring to the private sector by competitive means only the land remote sensing satellite. If the private sector does not pick the land remote sensing business, the Government operated system would terminate, nominally by 1988. The civil weather satellites would continue under Federal control.

It should be noted that the demise of the Federal Landsat program does not necessarily mean that all U.S. civil operational initiatives will cease. One firm, Astech, has stated its intention to launch with private funding its own satellites.

This option has the following attributes:

- The civil weather satellites would remain under Federal control.
- The Federal funding for the Landsat program would cease nominally by 1988.
- Land remote sensing data would be purchased by the Federal Government from foreign or domestic systems to the extent that the available data satisfy requirements.

The advantages and disadvantages of Option 4 are given below:

Advantages:

- o Would require no additional funds above the 1984 request that other options may require if subsidies are provided.

Disadvantages:

- o Does not substantially reduce size and scope of Government, because the weather satellites remain under Federal ownership.
- o Private sector development of a land remote sensing satellite may be delayed compared to other options.
- o Even in long term, Federal Government will carry full responsibility for funding civil weather satellites.

Discussion: The value of land satellite data to the U.S. Government has not been rigorously established. Federal user agencies have been happy to use data not provided at subsidized costs, but, if required to pay the full cost of land satellite data, they indicate an intention to consider other means to meet their needs. Therefore, to avoid discriminating against economically desirable alternatives, the Federal Government should allow agencies to choose the most cost effective means of obtaining the data. Thus, from the perspective of modifying the current manner of doing business, this option has minimal impact. The Landsat program is gradually phased down, which can be done through either continued Government operation or through the transfer of the complete or partial system to a private operator.

Maintenance of Data Continuity: Data continuity of Landsat-4 type products would not be assured.

National Security and International Obligations: Concerns in these areas are not significant in this option.

Market Growth and Ability: No significant market development is Federally sponsored under this option.

Cost and Subsidies: In near term this option has lowest cost to Government and requires no subsidies.

Financial Return to the Government: No significant financial return is achievable.

Price of Data to Users: For duration of operation of Federal system, the current prices (including announced increases) would apply.

F. Oversight Structure Under All Commercialization Options

A large number of Federal agencies are involved in civil space remote sensing. Table II-2 shows the agencies in the categories of data users, Research and Development (R&D), and managers. As part of any decision to commercialize these satellites, the Administration wants to ensure that undue burdens are not placed on the firm or firms during the formative years of the venture. A substantial burden would be having to deal individually with each of the agencies involved in remote sensing. To simplify the Federal interface responsibility, the Department of Commerce will be responsible for oversight and coordination of Federal data requirements, regulatory actions, and serving as the Federal agent for dealing with the private sector. The oversight structure is shown in Figure II-5.

G. The Administration's Decision

President Reagan announced on March 8, 1983 his decision to undertake the work necessary to determine whether there should be a transfer to the private sector of the Nation's civil operational remote sensing satellite systems. Such a transfer include the present Landsat system and the civil weather satellites--as well as responsibility for any future civil operational ocean observing system. It would be consistent with option 1 discussed above.

The transfer would be carried out by a competitive process that would allow firms to enter bids on the land and weather satellites separately or jointly. The competition would be limited to U.S. firms only. Financial and program justifications and proposals would be formatted so that submissions for individual systems could be compared to joint submissions.

National security and foreign policy concerns would be fully considered in preparing legislation, requesting proposals, and overseeing the private entity or entities.

The President's decision is based on a number of principles which recognize that private enterprise is the primary source of the Nation's economic strength. Civil operational earth observation is an activity which has the potential for substantially greater private sector involvement. The market for products from this application of space technology--from which revenues would flow to sustain such systems--has not developed as rapidly or extensively as it could have, because of the inherent limitations on the Government in extending domestic and international markets. An aggressive private entity or entities--without the limitations of a Government agency--can extend the uses of data products into:

Table II-2

OPTIONS FOR OVERSIGHT AND PROCUREMENT OF

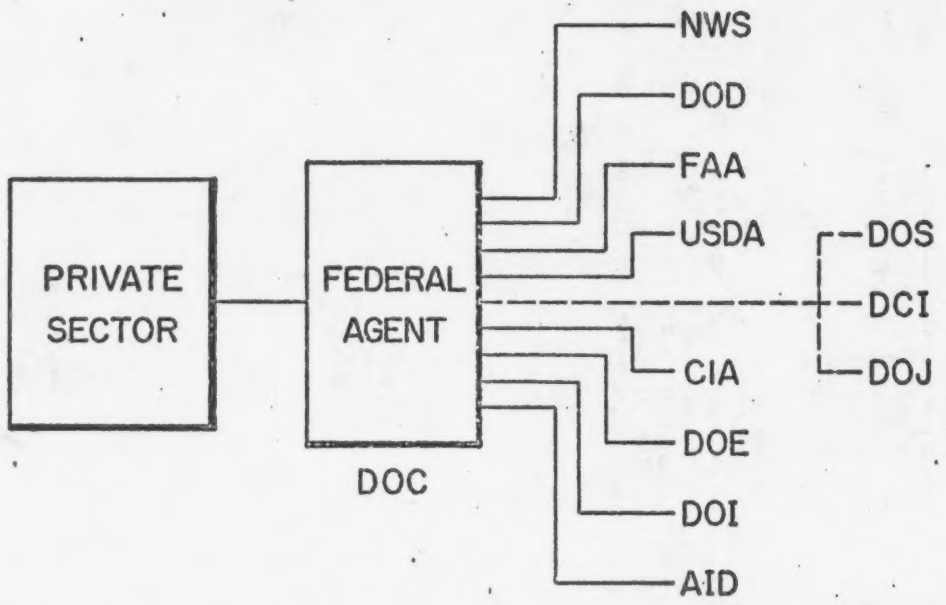
FEDERAL DATA REQUIREMENTS

An extensive number of Federal agencies are involved in civil space remote sensing. In the table below, the principal Federal participants are categorized according to whether they are data users, carry out advanced research on sensor systems, or have a management or regulatory role.

DATA USERS	R&D	MANAGERS
Weather Satellite Data	**Civil**	**Policy and Budget**
DOC/NOAA/NWS	NASA	OSTP
USAF/AWS/AFGWC	NOAA	CEA
USN/FNOC		OPD
DOD		OMB
FAA	**National Security**	
USDA		**Civil**
	DOD	
Land Satellite Data	DCI	DOC
		DOJ-Antitrust
USDA		
CIA		**International**
DOE		
DOI		DOS
AID		
		National Security
Ocean Satellite Data		
		DOD
USN		DCI
DOC/NOAA/NWS/NOS		ACDA
DOT/USCG		NSC

Figure II-5

MANAGEMENT OF FEDERAL DATA PURCHASES AND OVERSIGHT



- o Agriculture
- o Urban Planning and Land Use
- o Mineral Exploration
- o Provision of Specialized Weather Services
- o Fisheries
- o Ship Routing
- o Sea State Forecasting

Satellite remote sensing is currently a multihundred million dollar burden on the taxpayer. This cannot expand, or even be sustained, within the budget constraints imposed by the current economic emergency. An aggressive private sector development effort could make these capabilities available--without the full burden falling on the taxpayer. The expansion of non-Federal markets can develop the revenue stream necessary for capitalizing and operating these systems.

APPENDIX A. OVERVIEW OF CIVIL OPERATIONAL EARTH OBSERVING SATELLITES

A. Environmental Satellites

1. Historical Review

In 1961, Congress appropriated funds for the Department of Commerce (DOC) to establish, operate, and improve a system of space satellites to observe worldwide environmental conditions and to report, process, and apply these data. The National Aeronautics and Space Administration (NASA) was made responsible for procurement of spacecraft and launching services, with reimbursement from DOC. NASA also was to develop new space technology to improve the system.

DOC's operational environmental satellite program is managed by the National Oceanic and Atmospheric Administration (NOAA). The program evolved from the budding space program after the Korean War. Following the Russian launch of Sputnik in October 1957, the first successful meteorological experiments were conducted by the Explorer and Vanguard series of satellites. These experiments culminated in the launch on April 1, 1960 of TIROS-I, the world's first weather satellite. TIROS (Television Infrared Observation Satellite) was an immediate and outstanding success. Within a few days, operational use was being made of its cloud pictures from space by the Weather Bureau and military weather services.

In April 1961 an Interagency Panel, made up of representatives from the Department of Commerce, Department of Defense, National Aeronautics and Space Administration, and Federal Aviation Administration recommended that the United States establish a National Operational Meteorological Satellite System (NOMSS) with program and management responsibility placed in the Weather Bureau of the Department of Commerce. President Kennedy delivered a special message on the Nation's space program to a joint session of Congress on May 25, 1961. It included a request for funds for the Weather Bureau to establish such a system. Public Law 87-332 of September 30, 1961 provided the first appropriation for NOMSS.

Interagency agreement led to the formulation of national objectives for the NOMSS. They were to develop:

- An operational system for viewing the atmosphere regularly and reliably on a global basis, both day and night, with direct readout to local ground stations within radio range of the satellite.

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- o An operational system for continuous viewing of weather features and for collecting and relaying environmental data from remote platforms such as buoys, ships, automatic stations, aircraft, and balloons.
- o An operational system for sounding the atmosphere regularly and reliably on a global basis and for providing quantitative inputs to numerical weather predictions.
- o Applications of satellite data to improve environmental services.

a. Polar Orbiters

A total of ten experimental TIROS polar-orbiting satellites were launched through the period ending July 2, 1965. The TIROS Operational Satellite system was implemented with the launch of ESSA-1 (Environmental Survey Satellite) on February 3, 1966. ESSA-2 was launched on February 28, 1966.

The ESSA series was a dual satellite system; one spacecraft carried an Advanced Vidicon Camera System to acquire global images for relay to Washington, D.C., the other carried the newly developed Automatic Picture Transmission (APT) System for direct broadcast of images worldwide. A total of nine ESSA satellites were launched through February 26, 1969.

With paired ESSA satellites in orbit, one taking and storing worldwide pictures for later transmission to a Command and Data Acquisition (CDA) station for relay to a central meteorological processing center, and the other taking and transmitting pictures automatically to APT receiving stations within radio range, a National Operational Meteorological Satellite System became a reality, and its first objective was partially satisfied.

The ESSA satellites' cameras provided only daytime pictures. Day and night global coverage became possible on a routine basis with the launch on January 23, 1970 of NASA's prototype polar orbiter, the Improved TIROS Operational Satellite (ITOS)-1. NOAA-1, the first operational version of this series, was launched December 11, 1970. This second generation spacecraft combined the direct readout and stored data functions of the paired ESSA satellites and added scanning radiometers with infrared channels capable of obtaining direct readout and stored images of the Earth's night side. Thus, the first operational objective had been fully achieved.

In 1972 polar-orbiting satellite capability was expanded further with the launch of NOAA-2, the first operational environmental satellite to rely entirely on scanning radiometers for imagery in lieu of television-type camera systems. NOAA-2 also was the first operational environmental satellite capable of sounding the atmosphere regularly on a near-global basis. With the advent of NOAA-2, the third operational objective was partially satisfied. Three more satellites of this series were launched, the last being NOAA-5 on July 29, 1976.

During 1979, the ITOS satellite was replaced by the third generation polar-orbiting satellite system, the TIROS-N series. The TIROS-N series includes state-of-the-art advances in spacecraft and sensor technology to provide more accurate observations and new data not available from the ITOS system.

TIROS-N, the NASA prototype, was launched on October 13, 1978, and NOAA-6, the first NOAA-funded operational satellite of this series, was launched on June 27, 1979. On February 27, 1981, TIROS-N became inoperative. On June 23, 1981, NOAA-7 was successfully launched, and it became operational August 24, 1981.

b. Geostationary Satellites

The effort to fulfill the second objective -- continuous viewing of weather systems -- began late in 1966 with the launch of NASA's geostationary satellite, the Applications Technology Satellite (ATS-1). ATS-1 and ATS-3, launched almost a year later, provided useful information until an improved, operational system was established in 1974-75. Not only did these two experimental geostationary spacecraft demonstrate the feasibility of nearly continuous daytime cloud viewing, they also pioneered transmission of weather data from a Command and Data Acquisition station to the satellite and back down to local APT receivers. These satellites also were used in experiments to collect data automatically from remotely located weather sensors.

The successful ATS satellites formed the technological base for the Geostationary Operational Environmental Satellites (GOES). The first NASA prototype satellite, Synchronous Meteorological Satellite (SMS)-1 was launched May 17, 1974. The second NASA prototype, SMS-2, was launched February 6, 1975. These two satellites were placed 36,000 km above the equator at 75° and 135° West longitude respectively and provided coverage of most of the Western Hemisphere except in polar regions. Since then, SMS-1 and SMS-2 have been replaced by NOAA's operational GOES.

Table A-1: U.S. Environmental Satellites

Satellite	(1) Purpose	Launch	Average Altitude (km) (2)	Ceased Operation	(3) Remarks
TIROS 1	R	04/01/60	720	06/19/60	First weather satellite providing cloud cover photography
TIROS 2	R	11/23/60	672	02/01/61	
TIROS 3	R	07/12/61	760	10/30/61	
TIROS 4	R	02/08/62	773	06/12/62	
TIROS 5	R	06/19/62	778	05/05/63	
TIROS 6	R	09/18/62	694	10/11/63	
TIROS 7	R	06/19/63	645	02/03/66	
TIROS 8	R	12/21/63	749	01/22/66	First APT satellite.
Nimbus 1	R	08/28/64	S/677	09/23/64	Carried AVCS, APT, and High Resolution Infrared Radiometer for night pictures.
TIROS 9	R	01/22/65	S/1630	02/15/67	First TIROS satellite in Sun-synchronous orbit.
TIROS 10	O	07/01/65	S/792	07/03/66	
ESSA 1	O	02/03/66	S/765	05/08/67	First satellite in the operational system; carried 2 wide-angle TV cameras.
ESSA 2	O	02/28/66	S/1376	10/16/70	Carried APT cameras. APT carried on all even-numbered ESSA satellites.
Nimbus 2	R	05/15/66	S/1136	01/18/69	
ESSA 3	O	10/02/66	S/1427	10/09/68	Carried first AVCS cameras. AVCS carried on all odd-numbered ESSA satellites.
ATS 1	R	12/06/66	G/35,765	10/16/72 (pictures)	WEFAX discontinued December 31, 1978.
ESSA 4	O	01/26/67	S/1373	12/06/67	
ATS 2	R	04/05/67	-	-	Unstable attitude-data not useful.
ESSA 5	O	04/20/67	S/1379	02/20/70	
ATS 3	R	11/05/67	G/35,815	10/30/75 (pictures)	WEFAX discontinued December 31, 1978.

Satellite	Purpose (1)	Launch	Average Altitude (km) (2)	Ceased Operation	Remarks (3)
ESSA 6	O	11/10/67	S/1437	11/04/69	
ESSA 7	O	08/16/68	S/1440	07/19/69	
ESSA 8	O	12/15/68	S/1429	03/12/76	
ESSA 9	O	02/26/69	S/1456	11/15/73	
Nimbus 3	R	04/14/69	S/1100	01/22/72	Provided first vertical temperature profile data of the atmosphere on a global basis.
ITOS 1	R/O	01/23/70	S/1456	06/17/71	Second generation prototype.
Nimbus 4	R	04/08/70	S/1108	09/30/80	
NOAA 1	O	12/11/70	S/1438	08/19/71	First NOAA-funded second generation satellite.
ITOS B	O	10/21/71	-	-	Failed to orbit.
Landsat 1	R	07/23/72	S/918	02/16/78	
NOAA 2	O	10/15/72	S/1460	01/30/75	First operational satellite to carry all scanning radiometers.
Nimbus 5	R	12/12/72	S/1110	-	Still providing data.
ITOS E	O	07/16/73	-	-	Failed to orbit.
NOAA 3	O	11/06/73	S/1510	08/31/76	First operational satellite to permit direct broadcast of VTPR data.
SMS 1	R/O	05/17/74	G/35,788	01/29/81	Deactivated.
NOAA 4	O	11/15/74	S/1460	11/18/78	Deactivated.
Landsat 2	R	01/22/75	S/918	-	
SMS 2	R/O	02/06/75	G/35,800	-	VISSR failed 08/05/81; limited operational support at 100°W.
Nimbus 6	R	06/12/75	S/1110	-	
GOES 1	O	10/16/75	G/35,783	-	First NOAA operational geostationary satellite; 127°W on standby.
NOAA 5	O	07/29/76	S/1511	07/16/79	Deactivated.
GOES 2	O	06/16/77	G/35,785	-	Second NOAA operational geostationary satellite; 107°W on standby.
Landsat 3	R	03/05/78	S/918	-	First Landsat with infrared capability.
GOES 3	O	06/16/78	G/35,790	-	Third NOAA operational geostationary satellite; 90°W on standby.
Seasat 1	R	06/26/78	850	10/10/78	Electrical failure.

Satellite	Purpose (1)	Launch	Average Altitude (km) (2)	Ceased Operation	Remarks (3)
TIROS-N	R/O	10/13/78	S/850	02/27/81	Deactivated.
Nimbus 7	R	10/24/78	S/954	-	Carrying Coastal Zone Color Scanner.
NOAA 6	O	06/27/79	S/814	-	First NOAA-funded TIROS-N system satellite.
NOAA B	O	05/30/80	-	-	Failed to achieve an operational orbit.
GOES 4	O	09/09/80	G/35,791	-	First geostationary satellite to carry the VISSR Atmospheric Sounder (VAS); GOES West at 135°W.
GOES 5	O	05/22/81	G/35,786	-	GOES East at 75°W; also carries VAS.
NOAA 7	O	06/23/81	S/850	-	Second NOAA-funded TIROS-N system satellite.

(1) R - Research, O - Operations, R/O - Operational Prototype.
(2) S - Sun-synchronous, G - Geosynchronous.
(3) APT - Automatic Picture Transmission, AVCS - Advanced Vidicon Camera System,
WEFAX - Weather Facsimile, VTPR - Vertical Temperature Profile Radiometer
VISSR - Visible Infrared Spin-Scan Radiometer.
VAS - VISSR Atmospheric Sounder.

The GOES series of satellites carries multiple channel scanning radiometers that view the Earth in both the visible and infrared spectra. This permits near-continuous day and night viewing of storms and cloud cover and objective determination of wind fields at cloud altitude. This series of satellites includes a system for collecting data from remote, automatic environmental sensor platforms, as well as systems for direct broadcast of satellite images and weather maps. Starting with GOES-4, the new Visible and Infrared Spin-Scan Radiometer (VISSR) Atmospheric Sounder (VAS) instrument provided the first atmospheric temperature and moisture soundings from a geostationary satellite.

The GOES system satisfies the second goal of the operational system. The polar and geostationary spacecraft systems that have been described are complementary, and both are required to meet national needs.

2. Current Satellite Complement and Characteristics

a. Polar-Orbiting Satellites

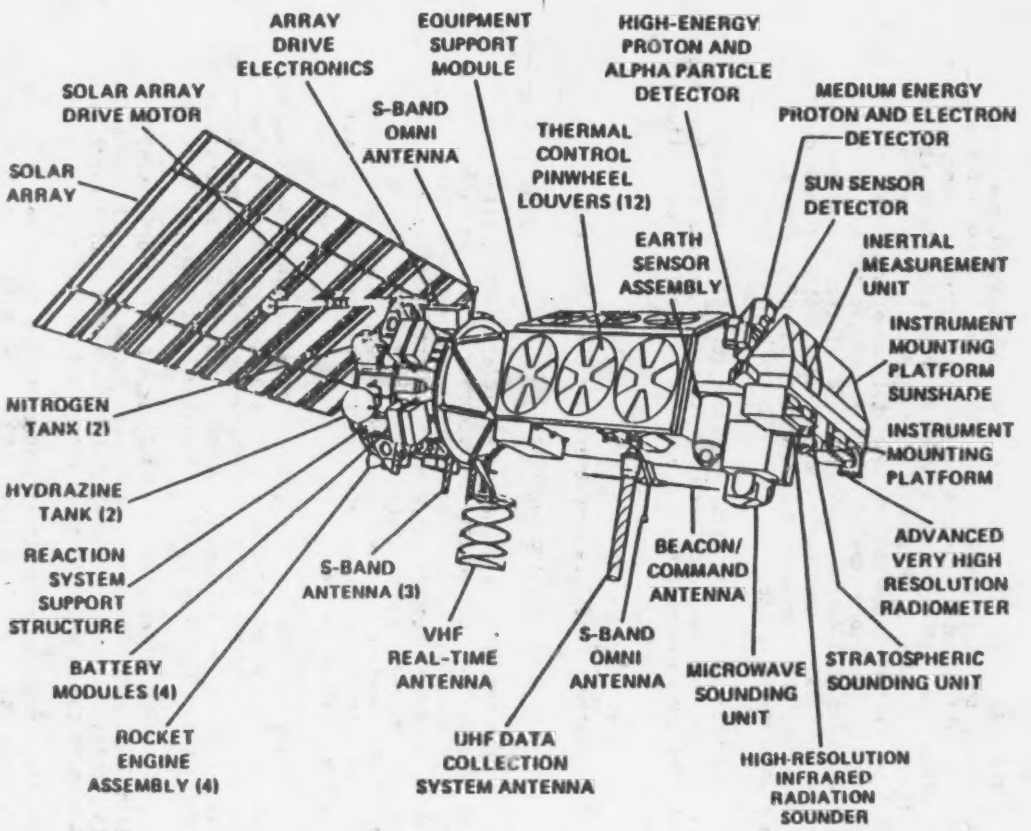
NOAA-6 and NOAA-7 are the current polar-orbiting satellites. They were designed to increase the accuracy of weather forecasting by providing quantitative data required for improved numerical prediction models. These spacecraft carry advanced instruments to provide improved temperature soundings, including microwave channels to facilitate sounding retrieval in cloudy areas. They also provide advanced multichannel image data and carry a data collection and platform location system.

During the lifetime of the NOAA system, new instruments may be added or substituted for others. Therefore, the spacecraft are designed for a 25 percent growth capability in terms of weight, volume, power, command, and telemetry. A new version of the spacecraft called the Advanced TIROS-N (ATN) will carry the first increase in payload.

The first ATN satellite, NOAA-E, is scheduled for launch in March 1983, and will carry a search and rescue capability, in addition to its standard instruments. Later satellites will carry sensors to measure the Earth's radiation budget and ozone.

The current polar-orbiting spacecraft are five-sided, box-like structures that are 3.71 m long, 1.88 m in diameter, and 1,409 kg in weight, including expendables. They carry four primary instrument

TIROS-N Spacecraft



systems. The Advanced Very High Resolution Radiometer (AVHRR) provides visible and infrared data for real-time transmission to both Automatic Picture Transmission (APT) and High Resolution Picture Transmission (HRPT) users and for storage on spacecraft tape recorders for later playback.

The TIROS Operational Vertical Sounder (TOVS) system combines data from several complementary sounding instruments on the spacecraft. These are the High Resolution Infrared Sounder (HIRS/2), the Stratospheric Sounding Unit (SSU), and the Microwave Sounding Unit (MSU).

The primary instrument providing tropospheric data, HIRS/2, is designed to provide data that permit calculation of vertical temperature profiles, water vapor content at three levels of the atmosphere, and total ozone content.

The SSU instrument provides temperature information from the stratosphere. This instrument is provided at no cost to the United States by the Meteorological Office of the United Kingdom. The third instrument, the MSU, is used in conjunction with the HIRS/2 instrument to permit atmospheric sounding computations to be made in the presence of clouds.

The Data Collection System (DCS) is provided by the Centre National d'Etudes Spatiales of France at no cost to the United States. The French call this the ARGOS Data Collection and Platform Location System. The ARGOS DCS provides a means to locate and collect data from moving and fixed platforms.

The Space Environment Monitor (SEM) measures solar proton flux, alpha particle and electron flux density, and energy spectrum and total particulate energy distribution at spacecraft altitude. The three detectors included within this instrument are the Total Energy Detector, Medium Energy Proton and Electron Detector, and High Energy Proton and Alpha Detector. This instrument augments the measurements made by NOAA's geostationary satellites. The data from the SEM are processed at Suitland, MD, and transmitted over a dedicated data link to NOAA's Space Environment Laboratory at Boulder, CO. These data, as well as geostationary data, are used to monitor the state of solar activity, which has a significant effect on terrestrial communications, electrical power distribution, and high-altitude aircraft flights.

b. Geostationary Satellites

Since GOES-1 was launched on October 16, 1975, four more GOES satellites have been put into orbit. Until recently, GOES-4, launched September 9, 1980, and GOES-5, launched May 22, 1981, were the operational geostationary satellites. On November 25, 1982, however, the remote-sensing instrument on GOES-4 failed, ending its imaging and sounding capability. GOES-1 is being used as a substitute until GOES-F is launched (scheduled for April 1983). Unfortunately, the infrared channel of the GOES-1 instrument is inoperative, and only visible channel viewing during daylight hours is possible.

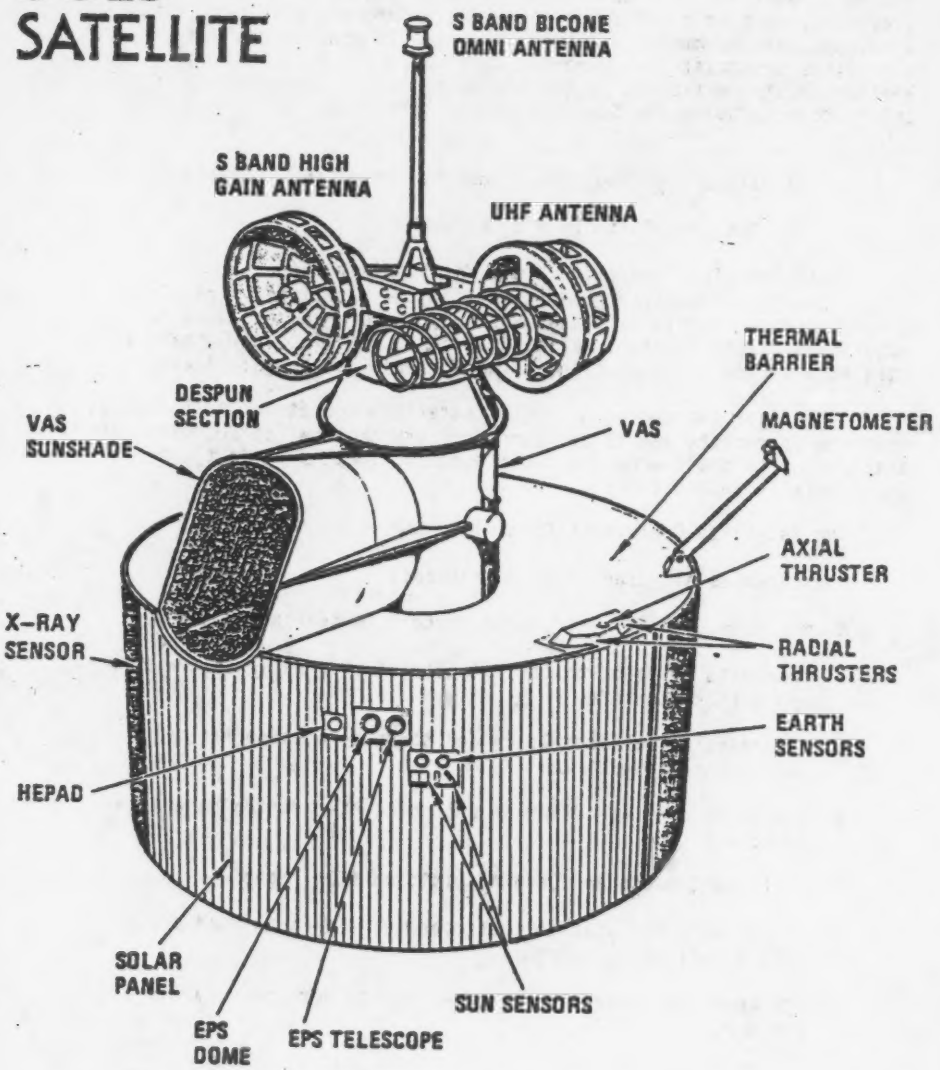
GOES-5 is located 36,000 km over the Equator at 75°W longitude and GOES-4, at 135°W. GOES-1 has been moved to 129°W longitude to provide temporary imaging until a replacement for GOES-4 is put on station. In the meantime, GOES-4 will serve as a data relay for GOES-1. The remaining satellites (GOES-2 and -3) provide limited operational support for data collection, weather facsimile services, and data relay.

The VISSR Atmospheric Sounder (VAS) is the principal instrument carried on geostationary satellites starting with GOES-4. The VAS has both imaging and sounding capability. It provides near-continuous cloud viewing with resolutions of 1, 2, 4 and 8 km in the visible wavelengths and 8 km in the infrared wavelength. Full Earth-disc pictures are available at 30-minute intervals throughout the day and night; partial disc pictures can be obtained at more frequent intervals to meet special requirements such as viewing development and movement of severe storms.

An additional capability of the VAS is multispectral imaging. The VAS has 12 infrared channels which are used to derive vertical temperature and moisture profiles over selected areas. Soundings from a geostationary satellite affords several advantages over soundings from a polar-orbiting satellite. They are (1) constant surveillance, (2) constant viewing geometry, (3) better determination of temporal and spatial gradients, (4) easier comparison with ground-based atmospheric soundings and (5) synoptic, large-area coverage.

The concept of obtaining atmospheric soundings from geostationary satellites currently is being tested. GOES-4 and -5 have been used in an operational demonstration program to determine the capability of the VAS. So far results have been excellent, and efforts are underway to develop a ground system to use the VAS data to improve NOAA's operational weather analysis and forecasting programs.

GOES SATELLITE



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GOES satellites also carry a Data Collection System to collect and relay environmental data observed by a variety of remotely located platforms, such as river and tide gages, seismometers, buoys, ships, airplanes, and automatic weather stations. In addition, these satellites broadcast environmental data to remote locations using the Weather Facsimile (WEFAX) system and collect data for warnings of solar activity using the Space Environment Monitor.

3. Satellite Tracking, Data Receipt, Processing, and Distribution

a. Command, Control, and Readout

These functions are carried out for NOAA's meteorological satellites by three major activities: (1) the Satellite Operations Control Center (SOCC), Suitland, Md., (2) the Command and Data Acquisition (CDA) Station, Wallops, Virginia, and (3) the Command and Data Acquisition (CDA) Station, Gilmore Creek (Fairbanks), Alaska.

SOCC is at the center of NOAA's satellite operations. It decides what the spacecraft are to be programmed or commanded to do. The CDA stations, with their ground/satellite radio links, provide the means to execute those decisions.

The Satellite Operations Control Center:

- o schedules all spacecraft operations;
- o monitors, via telemetry data, satellite health and safety;
- o transmits commands to the CDA stations for relay to the NOAA and GOES spacecraft;
- o records and evaluates long- and short-term spacecraft performance trends; and
- o serves as a joint NOAA/NASA control center during satellite launches.

The Wallops Command and Data Acquisition (CDA) Station:

- o is the only CDA station that operates with both NOAA and GOES satellite systems;
- o commands and reads out four NOAA orbits per spacecraft, per day;

- o commands and reads out the GOES-West (135°W) and GOES-East (75°W) satellites on a 24-hour basis. Also transmits to the imagery, Weather Facsimile (WEFAX) products, interrogations to Data Collection System platforms, and a time code for the National Bureau of Standards for rebroadcast by the GOES spacecraft to the user community;

- o also transmits WEFAX products through a third satellite (GOES-2 at 107°W) to provide WEFAX broadcast of weather charts for the National Weather Service. This replaces radio facsimile transmissions to Mexico and Central American countries.

The Gilmore Command and Data Acquisition (CDA) Station:

- o commands and reads out NOAA spacecraft only; and

- o because of its northerly location, "sees" and reads out four more NOAA orbits (eight per spacecraft per day) than does Wallops.

NOAA satellites orbit the Earth 14 times a day. However, because of their relatively low orbit, the satellites are not within range of either CDA station for one and sometimes two orbits a day, forcing data collection to continue into the next orbit. These are called "blind" orbits. Blind orbit data are stored by spacecraft tape recorders and transmitted later to Wallops or Gilmore. The current TIROS satellites, and those that will be flown during the 1980's, are not compatible with NASA's Tracking and Data Relay Satellite (TDRS) and, hence, require appropriately located ground stations. A crucial element in selecting ground station locations is their separation in longitude. It is this separation that determines the blind orbits of a polar-orbiting satellite.

Because of the importance of temperature soundings to weather analyses, arrangements have been made with the French for their CDA station at Lannion (Britanny) to read out sounding data and telemetry for the blind orbits. Lannion then relays the data to Wallops via the Data Collection System of the GOES satellite at 75°W. This allows NOAA to receive and process the time-critical sounding data prior to delayed acquisition by Wallops or Gilmore.

Lannion also has an emergency backup role and capability to command the NOAA satellites, if necessary, during launches and at times of major anomalies.

Support of NOAA operations by the French-owned and -operated Lannion station is at no cost to the United States.

b. Spacecraft Operation and Data Acquisition

(1) Polar-Orbiters

NOAA-6 and NOAA-7 fly in near-polar, sun-synchronous orbits of 810 and 850 km respectively. Each satellite covers the whole Earth twice in a 24-hour period. NOAA-6 crosses the Equator in a southward direction at 7:30 in the morning local time and in a northward direction at 7:30 in the evening, while NOAA-7 crosses in a northward direction at 2:30 in the afternoon local time and southward at 2:30 the next morning. Thus, satellite views are obtained for both the sunlit and dark sides of the Earth. With the two satellite system, any longitude position is viewed four times a day.

As the satellites orbit the Earth, information collected by their instruments is stored on tape recorders on board the spacecraft. When the satellites come within range of a Command and Data Acquisition (CDA) station, the recorder contents are transmitted to the ground, where the data are copied by ground recording systems. Each station has an 85-foot antenna to track the polar satellites. The two stations complement each other, allowing the on board recorder systems to be emptied before being overloaded by new data.

NOAA-N satellites also operate in a direct-readout mode. As the spacecraft collect sensor information into the on board computers for copying by the spacecraft recorders, the information also is broadcast concurrently for receipt by ground receiving stations within radio range. There are two modes of direct reception, the Automatic Picture Transmission (APT), in which image data are compressed in resolution and volume to match existing APT receiving systems and the High Resolution Picture Transmission (HRPT) mode. The APT mode contains only imagery, whereas the HRPT data contains the full telemetry data available for playback at the CDA. There are 76 (50 foreign, 17 U.S. military, 5 U.S. Government, 2 academic, and 2 commercial) known HRPT stations and over 800 known APT stations in some 120 countries.

(2) Geostationary Satellites

The geostationary satellites are controlled and operated from the Wallops Island CDA. The spacecraft altitude and orbit speed are such that the spacecraft orbits the earth at a rate matching the

rotation of the Earth. In this orbit, the satellite is positioned relative to a fixed longitude at the Equator. The eastern spacecraft, GOES-East, hovers above 75 degrees West longitude and the western spacecraft, GOES-West, hovers above 135 degrees West longitude at the Equator. These longitude positions were selected so both satellites are in view of the Wallops CDA for command and control purposes and to provide overlapping coverage of the central United States, in addition to critical Atlantic and Pacific Ocean coverage.

The geostationary satellites scan the Earth north to south as they spin in space at 100 revolutions a minute. Each spin records information of the Earth view adjacent to the previous scan. About 2,000 scan steps are required to provide a full North to South view of the Earth. A fully scanned geostationary view of the Earth from horizon to horizon (called full-disc view) covers 81 degrees of longitude east and west of the orbit longitude and 81 degrees of latitude north and south of the Equator. Useful cloud data are acquired for 70 degrees of longitude north and 55 degrees south (because of mechanical problems) and 70 degrees of latitude east and west of the sub-satellite point.

In contrast to the polar-orbiting mode of recording data on board spacecraft recorders for delayed playback, the geostationary satellite data are immediately transmitted to the ground as the satellite instrument scans the Earth. Each operational GOES satellite must have a dedicated ground antenna to receive a continuous flow of data. The relatively stable orbits make continuous antenna tracking unnecessary, though some minor pointing adjustments are required as minor oscillations occur.

The data are transmitted to a ground computer system at the CDA, where information containing scanner normalization and predicted Earth location parameters is added to each scan. These data immediately are transmitted back to the spacecraft, but at a slowed transmission rate. This slowed data transmission is called "stretched data." The stretched data then are transmitted from the satellite to relatively small ground receiver systems in real time.

c. Data Processing and Distribution

The polar and geostationary satellite systems have different data ingest and preprocessing system. However, the culmination of both processes is a combined product and data base of complementary data.

(1) Polar-Orbiting Satellite System

The ground system that receives digital data from the NOAA satellites consists of two major subsystems -- the Data Acquisition and Control Subsystem (DACS) and the Data Processing and Services Subsystem (DPSS). The DACS includes components at the Command and Data Acquisition stations, the Satellite Operations Control Center, the CDA station at Lannion, France, and the Satellite Field Services Station at San Francisco. All the DPSS components are in the NOAA facility at Suitland.

DACS is used to command and control the spacecraft, monitor its health via housekeeping telemetry, and retrieve and transmit the spacecraft environmental data to the DPSS processing and data handling facility.

The DPSS ingests the raw satellite data and preprocesses and stores them, along with appended auxiliary information, such as Earth location, time of observation, and quality-control parameters. The DPSS consists of several unique segments of high-speed computers, intermediate disk storage units and a mass storage system.

After NOAA satellite data are collected at a CDA station, they are retransmitted to the Satellite Operations Control Center in Suitland via an RCA SATCOM communications satellite. The data are received at Suitland by a DACS computer, which strips out the telemetry portion and passes the other data on to DPSS computers. The DACS function converts the telemetry information into engineering units for real-time monitoring by operations center personnel.

After ingest, the DPSS process analyzes and prepares the separate data sets for follow-on product processing and archiving. During this cycle, the data are read back from the disc storage and analyzed for time continuity, while the instrument responses are measured as compared to prelaunch calibration parameters. Adjustment coefficients to correct instrument responses and predicted Earth location parameters unique to each scan time are appended to each scan record during the process. After data preparation and preprocessing are completed, the data records are copied back to disc storage.

The prepared data sets with appended calibration correction coefficients and earth location parameters are referred to as the level 1b archive. This is compatible with the World Meteorological Organization (WMO) archive criteria for the World Climate Program.

POLAR-ORBITING SATELLITE SYSTEM

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Once in this form, the data are conditioned for optimum handling in the various computer processing steps that produce the regular operational output and are documented in a format suitable for search and retrieval.

After the data are copied in 1b form to disc, an archive system attaching to the same disc file starts the process of copying the 1b files from disc to an archive media. The archive system used at NESDIS is an AMPEX Terra Bit Memory (TBM) system. This system records the data in digital form on two-inch wide video tapes at a density of one million bits per inch. There are enough archive transports on the system to hold more than 24 hours of data collected from the two operational NOAA polar satellites. As a TBM reel is filled to capacity, it is dismounted and turned over to the NOAA archive facility for retention and can be remounted to service subsequent retrospective data requests. The archive function completes the DPSS step in the processing cycle.

After the data are recorded on the archive media, a catalog entry is established. A communications link between the AMPEX TBM system and the NOAA Central Computer Facility (CCF) is opened and data sets are copied to the CCF disc files; jobs are queued in the CCF system to access the data to perform the follow-on product processing step.

The DPSS also provides communication links to the NOAA Environmental Research Labs in Boulder, Colorado; to the British Meteorological Service in Bracknell, England; and to the Service ARGOS of the Centre National d'Etudes Spatiales in Toulouse, France. A new link is being established to transmit search and rescue data from the next NOAA polar-orbiting satellite (NOAA-E) to the U.S. Air Force at Scott Air Force Base, Illinois.

(2) Geostationary Satellite System

While polar satellite data are delayed and transmitted in bulk after CDA acquisition, geostationary data are received directly from the spacecraft in real time, via an 8-meter antenna mounted on the roof of the processing center at Suitland. The geostationary data are split at Suitland and routed to two separate processing systems. One system is used for ingest, preprocessing and archive processing, much in the manner described above for the DPSS polar data processing. The other system relays the data over a direct microwave link to a remote site in the World Weather Building (WWB) in Camp Springs, Maryland,

where the National Weather Service Washington Forecast Office and National Meteorological Center are collocated.

At the WWB site, the data are ingested by a computer system called the Central Data Distribution Facility (CDDF). After ingest, selected geographic portions of the image (sectors) are transmitted to seven field service stations in Washington, D.C.; Miami, Florida; Slidell, Louisiana; Kansas City, Missouri; San Francisco, California; Anchorage, Alaska; and Honolulu, Hawaii. The sectors are transmitted over telephone lines in facsimile format.

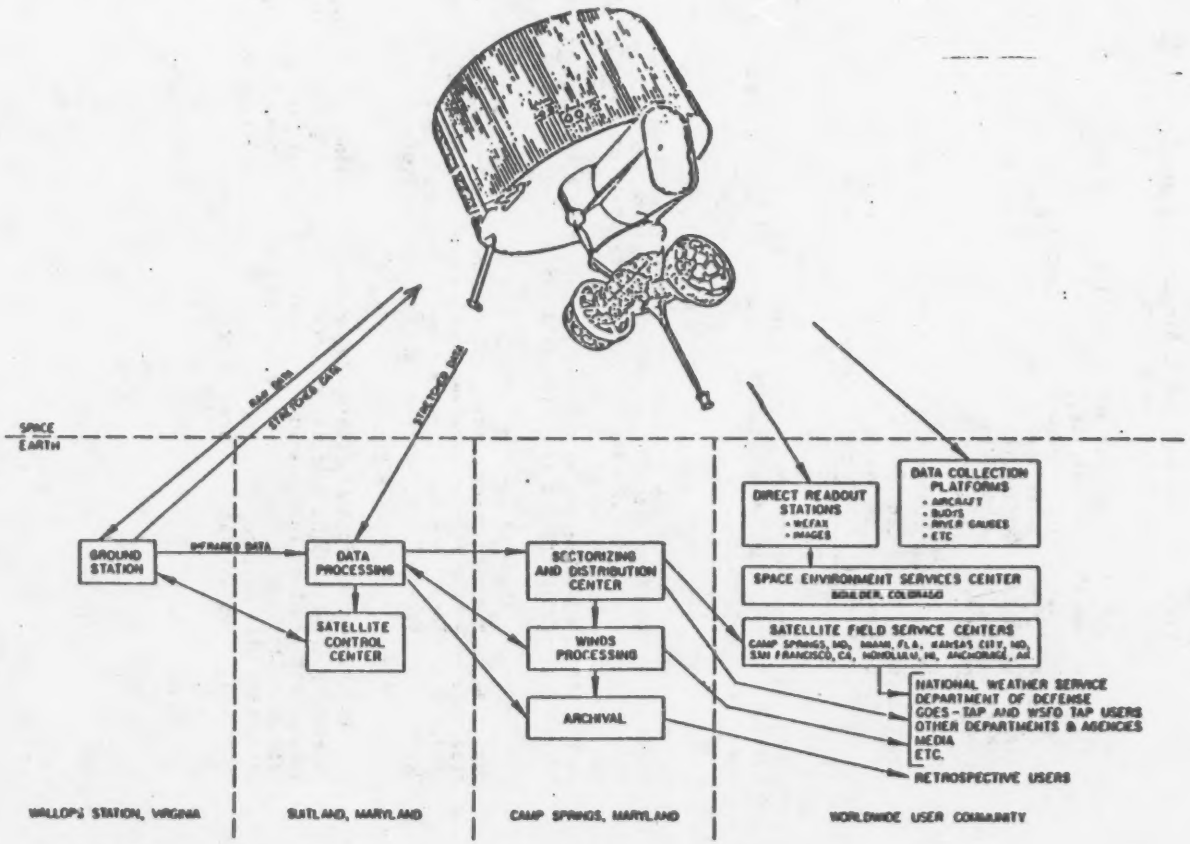
There are communications facilities at each field service site where external users can tap the signal being transmitted by the CDDF via telephone lines leased from local commercial vendors. This is known as the GOES-TAP System. Users subscribing to the service pay $1,000 to tap into the system and $100 per year administrative services fee. There are 153 GOES-TAP users online as of this writing. These users are able to copy data received by the satellite field service station. Special acquisitions outside of the field station needs are not permitted.

At the field stations and in the CDDF, the sector data are manually copied to a video disc system. Successive images melded together on the video disc form an animated cloud-motion image when rapidly sequenced. The animated imagery, which shows the dynamics of the atmosphere, coupled with the static facsimile image data, are used in the subjective analysis support provided by satellite analysts to weather forecasters and satellite data users.

At the Suitland processing center, GOES data are ingested in real time by a minicomputer system, which stores the incremental scan data on a disc file as received. After the full spacecraft scan cycle is completed, the data from the ingest disc are copied to the Central Computer Facility, where a computer program stores the resulting data in a data base file.

Under contract to NOAA, the Space Science and Engineering Center, University of Wisconsin, operates an Interim GOES Archive and Retrieval System that archives full resolution (1-km) GOES digital data and reproduces it upon request for the retrospective user community. The University will continue this service until a similar NOAA system is installed in the Suitland, MD area in about 18 months.

GEOSTATIONARY SATELLITE SYSTEM



d. Product Processing and Distribution

After the ingest data files become available for product processing, an array of processing and/or interactive analysis steps are initiated to produce near real-time products for distribution. To produce usable products from satellite data, two conditions must be met: the data must be calibrated (instrument responses corrected and converted to represent physical units) and Earth-located.

Calibration of satellite data requires mathematically modeling a physical measurement as a function of the remote-sensing instrument's electrical response. To do this successfully, one must know such quantities as the instrument's environment temperature and how it responds to certain extreme targets, such as cold space or a built-in calibration element with a known value in view of the sensor. The calibration process includes collecting the pertinent data to solve the necessary equations, determining coefficient values using prelaunch instrument test data provided by the manufacturer, and monitoring the calibration to support continuous production of qualitative and quantitative satellite data products.

A variety of observational data are used to determine each satellite's position and orientation in space. For the GOES satellites, certain land features are observed in the imagery, the Sun's position in the spin cycle is recorded, and the range (or distance) from the satellite to the ground receivers is measured. This information, taken together, is sufficient to determine the satellite's trajectory and orientation in space.

For the polar satellites, NOAA has an agreement (through NASA) with the North American Air Defense Command to track and determine the position of the satellites. This information is teletyped to the Suitland operations center once each day and is used to predict future satellite positions.

The GOES orientation in space is nearly fixed due to its high rate of spin. Its attitude is determined on the ground by using landmarks observed in the imagery. The polar satellites, on the other hand, are three-axis stabilized and are oriented by their on board attitude control systems to always point to the center of the Earth. This control system has proved accurate enough to eliminate the need for a ground-based attitude determination and prediction system.

Once the orbit and attitude of the satellites are known, Earth location parameters can be generated. The gridding data produced for both satellite systems include the data point locations of national,

state and geographical boundaries which may appear in the imagery. Each of these kinds of data are generated once each day to take advantage of updates in orbit and attitude.

For the polar satellites, the data are merged within the DPSS as the level 1b data sets are formed. For GOES data, Earth location and gridding data are added during the signal stretching process before retransmission back to the GOES spacecraft. Calibrated and Earth-located level 1b polar-orbiter data sets are passed to product processing systems and also are archived for retrospective users. Polar orbit information is teletyped worldwide for use by APT and HRPT direct readout users.

4. Satellite Data Products

Once the GOES and NOAA instrument data sets are fully processed into discrete instrument data files with appended calibration and Earth location parameters, a variety of computer and analytical products, are generated and distributed over various user links.

a. Quantitative Products

The basic quantitative product types produced are: atmospheric soundings; sea surface temperatures; global radiation budget; low-, medium-, and high-level wind vectors; composite-mapped imagery; image data bases; and atmospheric ozone measurements.

Atmospheric soundings are extracted from measurements made by the TIROS Operational Vertical Sounder (TOVS). TOVS soundings provide three dimensional observations of the atmosphere. The TOVS operational products are:

- Mean temperatures for 40 pressure levels from the surface to 0.10 millibars (up to 65.5 km).
- Precipitable water amounts for three layers: surface to 700 mb (10,000 ft), 700 - 500 mb (10,000-18,000 ft), and above 500 mb (18,000-30,000 ft).
- Clear radiance values.
- Numerical sounding coefficients.

Approximately 600 sounding retrievals are generated per orbit. The two polar-orbiting satellites provide a total of 16,000 soundings per day. The TOVS sounding product is transmitted over the Global Telecommunications System (GTS). The data also are stored in the NOAA Central Computer Facility data base in the conventional upper air sounding format for input to National Weather Service forecast models.

The primary user of the satellite soundings is the National Meteorological Center of the National Weather Service, which uses the data to supplement conventional sounding data for input to both the hemispheric and global numerical weather models. There are more than 200 worldwide users of TOVS sounding data, including NASA and the University of Wisconsin.

Intermediate radiance values are provided to the British Meteorological Office over the DPSS communications system. Raw data, quality control information and Earth-located, calibrated data are provided to the research community. All the data input, intermediate products, and processed sounding data are copied to the NOAA archive data base.

Sea Surface Temperature (SST) observations are obtained from the Advanced Very High Resolution Radiometer (AVHRR) sensors flown on the NOAA satellite series. Multi-channel techniques which employ the two visible and three infrared channels of the AVHRR are used to produce SST observations for both day and night coverage at a resolution of 8 kilometers. Global observations are produced with a resolution of 25 kilometers. In U.S. coastal regions, SST resolution is decreased to 8 kilometers, to improve the depiction of thermal gradients of vital concern to the fishing industry.

Between 20,000 and 40,000 SST observations are produced each day and stored in a user-accessible data base. The number of observations varies with cloud cover.

The primary data field is a file containing grid points at all one degree latitude/longitude intersections between 70 degrees South and 70 degrees North. In addition, there are three 50-km analyzed fields covering the 200 mile conservation and management zone. These cover the Atlantic Coast, Pacific Coast, and the waters between Hawaii and Alaska. A global 250 kilometer monthly mean field is maintained for satellite sea surface temperature observations.

SST observations are placed in an accessible data base within 8 hours of satellite data transmission. One observation from every two and one half degrees of latitude/longitude is transmitted twice

per day via GTS at 0900Z and 2100Z. A 100-km analyzed field is produced daily and stored on the CCF data base for access by computer terminal users. All analyzed data fields are averaged to generate weekly contour charts. Monthly contour charts also are distributed to users on a subscription basis.

Satellite observations augment ship and buoy observations used in the analyzed SST charts produced by the NWS and the Navy Fleet Numerical Oceanographic Center. SST data are used by the National Hurricane Center in Miami, Florida to monitor conditions conducive to hurricane formation and intensification. Private fishing companies refer to the analyzed fields to aid in the location of tuna and salmon fishing grounds. In addition, the isotherm contour charts are used in weather forecasting, physical and biological oceanographic research, and climatology by research centers, oceanographic and meteorological services, universities, corporations, and private individuals.

Measurements of low-level winds over the ocean are obtained three times a day for the region 50 degrees North to 50 degrees South, 20 degrees West to 125 degrees West, using data from the GOES-East satellite, and for the region 50 degrees North to 50 degrees South, 120 degrees West to 170 degrees East using data from the GOES-West satellite. Approximately 1,200 wind measurements are automatically calculated each day and manually quality controlled before being disseminated along with manually derived mid- and high-level wind measurements.

Clouds having equivalent black body temperatures greater than the 700-mb air temperature are examined for motion using cross correlation, and cloud displacements obtained are translated into Earth-located wind estimates.

Automated low-level winds, called picture pair winds, are derived from 8-km resolution infrared images. A pair of IR images one half hour apart are selected by analyzing picture quality and proximity of picture times to the synoptic weather observation times. The selected pair is precisely registered using landmark features and prominent surface thermal features. Low-level winds are extracted at preselected locations spaced approximately 250 kilometers apart.

A facsimile map is produced which shows the composite of winds derived from both satellites. Picture pair winds are obtained three times per day at 2200, 1000, 1600 Greenwich time (Z) and delivered to users by 0300Z, 1500Z, and 2100Z, respectively.

Wind measurements are used in numerical weather and ocean analysis and in forecast models by the National Meteorological Center of NWS, the Air Force Global Weather Center, and the Navy Fleet Numerical Oceanographic Center. Users worldwide receive the data via the Global Telecommunications System and retrospective users can access the data through the NESDIS archive service.

The global radiation budget is analyzed from polar-orbiting satellite data. Measurements of daytime and nighttime outgoing longwave flux and incoming available and absorbed solar radiation are made using infrared and visible radiances averaged for 50-km regions. These measurements are combined with time, Earth location, and angular measurements of satellite and solar altitude to form an initial data base for analysis.

Radiation budget measurements are mapped into 2.5 degree latitude/longitude fields (250-km resolution) and stored on a monthly archive file. The global radiation budget fields are important to long range forecasting and climate research. They are used by the Atmospheric Energetics Branch of the NESDIS Office of Research and the Long Range Prediction Group of the NWS.

Satellite image products are produced for dissemination over facsimile networks in near real time. The image products are derived from visible and infrared sensor data from both the geostationary and polar operational satellites.

The computer process involved includes geometric and radiometric enhancements of the imagery. The data from the polar-orbiting satellites are formatted to polar stereographic and Mercator map projections to form digital mosaics. Sectors of the polar-mapped data and of the geostationary full-Earth disc data sets are merged with the appropriate earth grids and coastlines and formatted for facsimile output and photographic reproduction. The sectors are disseminated to the users via National Weather Service facsimile circuits and the Weather Facsimile (WEFAX) communication system on the GOES satellite. Currently, 416 sectors are transmitted on a fixed schedule basis each day. Approximately 350 satellite photographic products are distributed to users daily.

Some of the major image product users include: the Department of Defense, the Central Intelligence Agency, the National Weather Service, the Department of Agriculture, and the Goddard Space Flight Center. The composite map arrays of polar-orbiter image data are archived in digital and photographic form in the NOAA archive facility for retrospective dissemination.

The GOES VISSR Data Base (VDB) is a digital data file which permits almost instant access to GOES infrared and visible data through computer terminals. The VDB consists of 96 8-km resolution pictures (72 infrared and 24 visible) and 10 4-km resolution visible pictures, all of which are refreshed continually in real time, using data from both GOES-East and GOES-West. Each 8-kilometer picture has a latitude extent from 50 degrees South to 50 degrees North and a longitude extent of 100 degrees centered at 75 degrees West for the GOES-East and 135 degrees for GOES West. Eighteen of each of the West and East 8-km pictures centered around synoptic time periods are copied to computer tape each day for archival.

VISSR Data Base users and uses include: the University of Florida in cooperation with the NWS in support of the Florida citrus industry; low-level wind measurements produced three times a day for both the Atlantic and the Pacific; mapping the extent of snow in U.S. river basins using the 4-km pictures; selective archive for NWS product development purposes; sea-surface thermal patterns at 8-km resolution used to delineate the features of the Gulf Stream system and the Gulf of Mexico loop current for oceanographic users; and sectors distributed to NWS offices. Other users of the GOES sea-surface thermal composites include the Navy, the Environmental Protection Agency, and the National Marine Fisheries Service.

One channel of the High Resolution Infrared Sounder is sensitive to total ozone. This and other TOVS channels are used to produce total ozone values (Dobson units) as part of the routine temperature retrieval process and is available on the NOAA CCF data base. The Climate Analysis Center in NWS accesses the total ozone values daily to produce analyses of total ozone for climate studies.

b. Analytical Products

In addition to the quantitative processes discussed above, a number of analytical services enhances the value of satellite data delivered to the user community.

A staff of meteorologists expert in satellite data interpretation work around the clock to provide analytical support to the National Meteorological Center in the NWS. The areas of principal support include: aviation forecasting, upper air analysis -- particularly in areas devoid of conventionally observed data -- quantitative precipitation, issuance of tropical storm bulletins, warnings to the

aviation industry of detected ash clouds from volcanic eruptions, jet stream analysis, snow cover, arctic and antarctic ice analysis, and detection of rapidly developing coastal winter storms.

There are seven Satellite Field Services Stations (SFSS) which are staffed around the clock to provide regional analytical support to the collocated weather forecast offices. The Kansas City SFSS, for example, provides satellite data analyses to the collocated National Severe Storm Forecast Center. There convective storm systems are detected and tracked with alert bulletins and severe weather advisories. Flash flood alerts and warnings are associated with these storm systems.

c. Time-Critical Operations

(1) Forecast Deadlines

Most satellite products and services are used in support of near real-time activities. There often are tight and rigid deadlines to be met where delays result in the loss of satellite data. The forecast models run by the NWS National Meteorological Center, for example, have rigid synoptic time cutoffs for data covering specific geographic areas.

The Local Fine Mesh (LFM) model is run at one hour plus twenty minutes after the 1200 and 0000 Greenwich hour synoptic cutoff times. Since the LFM confines the forecast to the continental United States and adjacent ocean areas, where weather usually moves from west to east, data from the northeast Pacific are extremely critical. This area is devoid of conventional observations.

The orbit times, coupled with the processing delays, make it currently impossible to provide coverage over the northeastern Pacific in time for the critical LFM forecast times.

The solution will be a change in the satellite orbit time and an augmentation to the present data ingest and preprocessing computer system. NOAA has analyzed the cost of configuring future polar-orbiting spacecraft to fly in a 1:30 pm ascending orbit so that the geographic coverage will include the northeastern Pacific Ocean during the 0000Z and 1200Z synoptic forecast times. NOAA also currently is procuring additional computer hardware to enable the data preprocessing and archive cycles to be run in half the present time. The goal is to provide the satellite products to the users and to the NMC data bases within 60 minutes after receipt of data from the CDA station.

(2) Facsimile Deadlines

All facsimile and WEFAX sector broadcasts are transmitted on a rigid time schedule, where as little as a 30-second delay will result in data loss. All satellite image data products rapidly lose value with time, as most of these products are used in near real-time event monitoring functions.

(3) Search and Rescue Deadlines

The search and rescue receiver to be flown on NOAA-E and subsequent polar-orbiting satellites will monitor emergency radio frequencies and record emergency broadcasts as the satellite passes within radio range. These transmissions will be read out by ground stations and retransmitted to Scott Air Force Base in Illinois for action. The planned turnaround time is less than 60 minutes after the emergency broadcast is received at the ground stations.

5. Data Archives and Services Facility

NOAA's Satellite Data Services Division is the national archive for all NOAA operational satellite data, data products, and information and of data and information for several non-NOAA satellites (i.e., DMSP, GOES-3, SEASAT, NIMBUS-7).

The SDSD archive dates back to April 1960 (TIROS-1) and continues through the present (GOES-EAST, GOES-WEST, and NOAA-7). Archive products consists of film negatives (25x25 cm, 35mm, 16mm, and 70mm), paper chart products, and digital tapes. The Division holds the equivalent of over 105,000 digital tapes and 10,000,000 images from 36 satellites carrying 25 different sensors. Annual active accessions of archived products include nearly 250,000 film products and the equivalent of over 8,000 CCTs.

The SDSD archives and reproduces all or portions of these data and data products on a retrospective basis for users throughout the world on a cost recovery basis. It has reproduced data for users in all 50 States, the District of Columbia, two U.S. territories, and 90 foreign countries.

6. Remote Data Collection and Platform Location System

The polar orbiting satellites also acquire data from remote ground, ocean, and atmospheric data collection platforms located

around the world. These platforms include drifting and moored ocean buoys, balloons, and river gages. They are equipped with automatic measuring devices, as well as radio transmitters to make contact with the satellites.

This is a cooperative program involving NOAA, NASA, and the French Space Agency (CNES) whereby the NOAA polar spacecraft are equipped with a French data collection and platform location system known as ARGOS.

In addition to collecting data, the ARGOS system provides information on where a moving platform was located at the time the data were received by the spacecraft. This provides information essential for the determination of fluid motion such as ocean currents or atmospheric winds. Data collection from stationary platforms provides data such as surface winds and pressures, rainfall amounts, river levels, sea salinities and subsurface oceanic temperatures.

Satellite data collection has become a significant feature of many experimental and operational environmental programs. Data collection platforms (DCP) are installed at remote land sites and, operating in conjunction with automatic weather stations, transmit regular reports required for weather forecasting purposes. The DCP's can operate automatically and unattended for long periods of time in remote and/or harsh environments, obviating the need for costly conventional communications and difficult trips to the site to collect data. DCP's also are very useful in maritime operations. Buoys moored at sea provide timely information on sea conditions such as wave height and frequency and sea temperature. Such information is used to prepare forecasts of sea state in support of fishing operations, marine transportation and coastal warnings.

Users of the ARGOS data collection system include both U.S. and foreign governments and private concerns. Currently, ten government agencies participate in a joint tariff agreement which provides them with a reduced tariff rate for data processing in exchange for a guaranteed level of usage. A similar rate structure is available to other users, subject to similar terms and conditions.

Under the terms of the current NOAA, NASA, and CNES agreement, all data collected by the ARGOS system are made freely available to the international meteorological community via the Global Telecommunication System of the World Meteorological Organization for use in weather analysis and forecasting. The United States, therefore, has access on a routine basis to environmental data collected globally by international as well as domestic users of the ARGOS system. This

provides U.S. weather forecasters with data they need without requiring the United States to bear the burden of establishing a global network of data collection platforms.

7. International Data Exchange

Since the early 1960's the United States has been the keystone of a highly cooperative and complex international data exchange network based on the fact that no Nation can meet its needs for weather services without using data acquired by other countries. In this context, U.S. weather satellites provide direct readout services to foreign as well as domestic users.

For the past two decades, the United States has encouraged the direct reception by countries worldwide of data from U.S. civil weather satellites. More than 800 stations in more than 120 nations now receive directly at least some portion of their weather data from NOAA satellites.

In addition to providing satellite data by direct readout, the United States makes satellite data and products available to all nations through the World Meteorological Organization's Global Telecommunication System.

No fees are charged for U.S. satellite data received either directly or through the GTS. Other national governments have joined the United States in the free exchange of satellite weather data. Given the U.S. need for global weather data, the United States benefits equally from this pattern of free exchange of weather data. Indeed, foreign weather data are critical to many U.S. Government activities, both civil and military.

8. Civil and Military Relationships

Prior to 1973, the DOC and the DOD managed and operated separate meteorological satellite systems to meet basic civilian and military needs. In October 1972, NASA and NOAA having requested developmental funding for the new TIROS-N series of spacecraft, the Office of Management and Budget asked the Department of Commerce to take the lead in investigating convergence of the NASA/NOAA (DOC) and DOD polar-orbiting meteorological satellite systems. The results of this study were submitted to the OMB in May 1973.

During the latter half of 1973, OMB reviewed the study, as well as position papers prepared by the State Department, the National Security Council's Under Secretaries Committee,* and the Assistant to the President for National Security Affairs. At the conclusion of this review, the OMB recommended that the next generation of polar-orbiting satellites consist of separate NOAA/NASA and DOD satellite systems with common components. To implement this decision, a joint DOC, NASA, DOD agreement was negotiated and signed in September 1974 to provide for coordination of the Defense Meteorological Satellite Program (DMSP) and TIROS-N program, and to work toward further convergence in the long term. The current NOAA and DMSP programs have been using a common spacecraft bus for their satellites in polar orbit.

In 1977, President Carter requested the Policy Review Committee for Space [PRC(S)],* under the chairmanship of the Director, Office of Science and Technology Policy, to review U.S. space policy. This review, which took place during 1978, culminated in issuance of PD/NSC-42 on October 10, 1978. This Presidential Directive stated, in part:

> In the FY 1980 budget review, OMB -- in cooperation with Defense, the DCI, NASA and NOAA -- will conduct a cross-cut review of meteorological satellite programs to determine the potential for future budgetary savings and program efficiency. Based on this cross-cut, the PRC(S) will assess the feasibility and policy implications of program consolidation by April 1, 1979.

A joint report was prepared by DOD, NASA and NOAA and submitted to OMB on March 11, 1979. The ensuing policy review by the PRC(S) resulted in the issuance of PD/NSC-54 on November 16, 1979. This Presidential Directive reaffirmed the nation's commitment to separate civil and military polar orbiting meteorological satellite systems. It further assigned to NOAA in the Department of Commerce responsibility for all civil operational remote sensing activities, including land remote sensing in addition to its ongoing atmospheric and oceanic responsibilities.

*Analogous to today's Senior Interagency Group on Space -- SIG (Space)

The most recent statements of national space policy released July 14, 1982 (NSDD - 42) continued the separation of civil and national security space programs. This policy declaration further defined the role of the Department of Commerce as the manager of Federal civil operational space remote sensing systems.

a. NOAA and Defense Polar-Orbiting Satellite Programs

There has been a clear and consistent definition of civil and defense roles in the application of space technology, beginning with the National Space Act of 1958 and continuing through the issuance of the most recent restatements of national space policy. The DOD is to apply this technology to the military and security needs of the Nation, while the civil program is to promote U.S. scientific and technological leadership, satisfy domestic needs, and promote an open, cooperative, and positive international image.

As applied to the management functional structures of the nation's operational environmental satellite systems, this policy position has been even more carefully established and its details more precisely stated. The intense 1973 review of the status of these environmental satellite systems, as well as the extensive 1977-78 and 1981-82 re-examination of the issues these systems raise, each resulted in a reaffirmation and further specification of the standing national policy position relating to these systems.

As a result of system planning and implementation activities carried out by the DOD and NOAA/NASA in accordance with policy direction:

- o separate systems under separate management, but sharing common components, have been developed and projected for continuance;
- o the international commitment of the civil system has been expanded, and,
- o the capabilities of the military system have been developed to meet more completely the full range of DOD needs.

The continued operation of a satellite system fully responsive to U.S. defense needs is an uncontested national requirement. Separate systems, designed to satisfy these separate demands individually, and using common components whenever possible, are necessary if these demands are each to be met properly.

The defense and civil meteorological satellite programs have been mutually supportive. Not only is there a free exchange of data and products, there also is the critical support provided by mutual backup in the event of system failures.

(1) Current Civil and Defense Requirements

Requirements for the National Operational Meteorological Satellite System (the civilian system) were first developed in 1961 by a joint interagency Panel on Meteorological Satellites and responded to the stated needs of the user agencies which include DOC, USDA, DOI, DOD, and FAA. The system was initiated to satisfy the basic national and international meteorological satellite observing needs in accordance with the Space Act of 1958.

DMSP requirements, on the other hand, have been tailored to support specific strategic and tactical missions of the DOD. These requirements are specified by various Joint Chiefs of Staff memos.

The civil and DOD agencies have initiated operational systems in accordance with the Space Act, which states:

> The Congress declares that the general welfare and security of the United States require that adequate provision be made for aeronautical and space activities. The Congress further declares that such activities shall be the responsibility of and shall be directed by, a civilian agency exercising control over aeronautical and space activities sponsored by the United States, except that activities peculiar to or primarily associated with the development of weapons systems, military operations, or the defense of the United States (including the

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research and development necessary to make effective provision for the defense of the United States) shall be the reponsibility of, and shall be directed by, the Department of Defense; and that determination as to which such agency has responsibility for and direction of any such activities shall be made by the President...

Through the years, close coordination has been maintained between NASA, the DOD, and the DOC in updating requirements to reflect the technology advances accruing from the research programs of each agency. Once the requirements have been identified, available technology is reviewed to determine if cost-effective means of meeting those requirements are available. Where the answer is affirmative, sensors are approved for development.

It is a prerequisite for both DOD and civil programs that conceptual means for meeting requirements be proof-tested before an instrument is approved for flight. Where concepts are unproven, operational implementation is delayed until the necessary research and development have been completed. The basic program then is defined by ordering the priority of requirements within the limits of technological feasibility and the availability of funds.

(2) System Requirements for the Next Generation (Shuttle Era)

Civil System Requirements

- Uninterrupted daily global coverage to acquire quantitative vertical sounding data necessary for input into numerical weather analysis models at the National Meteorological Center. These requirements are essential to NOAA in meeting its responsibility for routinely generating reliable extended-range weather forecasts to meet domestic needs as well as U.S. obligations to the World Meteorological Organization.

- Direct broadcast from the primary instruments to worldwide APT and HRPT sites.

- Routine collection, location determination, and relay of meteorological data from remote platforms such as buoys, ships, automatic stations, aircraft, and balloons.

DOD System Requirements

- Flexible selection of launch dates and times, precise orbit parameters, and daily coverage with secure command, control, and payload management is required with operational satellites continuously in orbit. These are necessary for DOD to insure timely and responsive acquisition of high resolution visual/infrared cloud cover imagery and ionospheric data to meet high priority national defense requirements.

- Sensor design and spacecraft system integration management is required for the primary DOD instrument (visual/infrared imager) and the specialized meteorological instruments (microwave temperature sounder, ionospheric monitor, and microwave imager) to provide for centralized automated processing and for formatting for direct tactical readout.

- Direct encrypted broadcast to tactical receivers deployed on carriers and in transportable vans is required. These tactical receivers have been used since 1965; by 1985 more than 30 terminals will provide support to all four military services deployed around the world.

Common Data Requirements

There are data requirements common to both DOD and DOC. These requirements could be satisfied by common sensor development and a single data processing center communicating with other processing centers for further distribution. Common data requirements are:

- Global mapped and gridded imagery (infrared and visible) in hard copy and computer-compatible (digital) formats

- Global atmospheric vertical temperature and moisture profiles

- Global thermal radiation maps

- Global and local snow and ice cover

- Space environmental parameters (particle fluxes, ionospheric structure, etc.)

- Global precipitation estimates

- o Soil moisture*
- o Surface winds*

(3) Distinctions between the Civil and Defense Meteorological Satellite Programs

The primary reasons for the continuation of separate civil and defense meteorological satellite programs are the clear distinctions in their missions. The Defense Meteorological Satellite Program is under direct military command authority and must be fully responsive to the needs of national security. The civil program primarily supports the mission of the National Weather Service, other Federal agencies and the civil sector. It further fulfills U.S. obligations in the free and open exchange of weather data between and among all nations. These distinctions are highlighted in Table A-2.

b. DOD Uses of GOES

In addition to the use of data from the civil polar-orbiting meteorological satellites, the DOD makes full use of the data from the Geostationary Operational Environmental Satellites (GOES). Navy and Air Force base weather stations, the Air Force Global Weather Central (AFGWC) and the Fleet Numerical Oceanographic Center (FNOC) use GOES imagery to prepare routine and specialized weather analyses and forecasts.

GOES data are particularly useful for the analysis of weather over the oceanic areas off both coasts of the United States. DOD forecasters use GOES imagery produced at 30-minute intervals and at the rapid scan rate of 15 minutes to make detailed terminal and route forecasts for air and naval forces and for major training exercises of all the services.

Through civil international data exchange agreements, both civil and DOD weather services in the United States and overseas also have access to geostationary meteorological satellite data from Japan (GMS at 140°E) and from the European Space Agency (METEOSAT at 0° longitude). These data extend the availability of routine cloud

(*Require R&D to be satisfied by the next generation systems.)

TABLE A-2: Distinctions in Missions, Civil and Defense Meteorological Satellite Programs

	Defense	Civil
Time of Day:	Dependent upon the needs of the national security missions supported	Set by the observational needs of the National Meteorological Center for numerical weather analyses and forecasts.
Primary Data:	Global high-resolution imagery from high-resolution visible and infrared sensors.	Global high-resolution atmospheric temperature sounding data from infrared and microwave radiometers. Sea-surface temperature data from multichannel infrared radiometers.
Processed Data:	Mapped and gridded imagery cloud analyses and cloud forecasts	Quantitative values of atmospheric vertical temperatures and sea-surface temperatures at various analysis scales
Secondary Data:	Low-resolution atmospheric temperature soundings from infrared and microwave sensors Solar environmental data Radiation data	Cloud cover imagery from multichannel infrared and visible radiometers Solar Environmental Data
Data Dissemination:	Downlinks are encrypted for receipt at primary receiving sites and at mobile tactical sites. Cloud imagery and secondary data are available to the civil sector from the Air Force Global Weather Central	Cloud imagery and sounding data broadcast continuously worldwide. Processed data distributed internationally according to World Meteorological Organization conventions. Data and products available to retrospective users worldwide on a cost recovery basis.

imagery to eastern Europe and eastern Asia between 50°N and 50°S latitudes.

The mobile tactical weather satellite receivers used by both the Air Force and Navy receive Weather Facsimile (WEFAX) broadcasts of GOES imagery and weather charts (produced by the National Meteorological Center). These data are broadcast through the GOES East (75°W), GOES West (135°W) and GOES Central (107°W).* The WEFAX broadcasts are valuable sources of weather data for DOD operations on remote islands, in isolated areas, and on naval ships at sea.

Beside WEFAX receivers, DOD has ground receivers at FNOC, AFGWC, and at the Air Force Geophysics Lab (AFGL) for the direct reception of GOES visible and infrared imagery. The imagery is used at FNOC and AFGWC for routine and specialized weather analyses and forecasts. At AFGL and at FNOC, GOES data also are used for research and development. The remainder of DOD weather sites in the continental United States and Hawaii obtain their GOES data through the GOES-TAP system. DOD has 48 stations tied to the GOES-TAP system.

The Corps of Engineers (COE) of the Department of Army makes considerable use of the GOES Data Collection System, which relays data signals from remote fixed and mobile sensors through the satellite to central collection and data processing centers. The COE has deployed some 827 data collection platforms over the river and watershed network of the nation. The sensors on these platforms monitor stream flow, stream levels, precipitation, etc. Data from the sensors is used by the COE in stream monitoring and water resources management programs.

c. Shared Data Processing

One major cooperative activity between DOD and NOAA is the agreement to implement Shared Data Processing among satellite data processing centers. The Shared Data Processing concept evolved from common data requirements at NOAA, Air Force Global Weather Central

*GOES Central is a GOES satellite whose imaging sensors have failed, but whose WEFAX transponder is still operating.

(AFGWC) and Fleet Numerical Oceanographic Center (FNOC). An important objective of Shared Data Processing is to minimize duplicate data processing at each of the centers.

Through a Memorandum of Agreement signed in December 1980, the DOD and NOAA will implement Shared Data Processing under the concept of the Center of Expertise. Under this concept, each ground data processing center, based on its primary data requirement, will produce and deliver certain polar-orbiting meteorological data and products to the other two centers. NOAA is designated the center for global atmospheric soundings, AFGWC the center for global mapped infrared and visible imagery, and FNOC the center for oceanic parameters.

Under the Shared Data Processing concept, NOAA will be the nation's sole operational producer and distributor of infrared and microwave sounding data. This includes the production and distribution to DOD processing centers of data from the Defense Meteorological Satellite Program (DMSP) microwave sounding instruments. Similar operational production and distribution concepts will be implemented at AFGWC for global mapped cloud imagery and at FNOC for global oceanic and precipitation parameters.

Shared Data Processing will allow NOAA to access AFGWC and FNOC data bases containing satellite sensor data from DOD spacecraft. These data then will be available on an operational basis to civil users. The DMSP microwave sounding and microwave imaging sensors, for example, will provide NOAA and the agricultural community with data useful for deriving precipitation over land and for estimating soil moisture. Another important benefit of Shared Data Processing will be the assurance of data continuity. In the event of a NOAA or DMSP spacecraft failure or ground data interruption, data continuity can be maintained through processing center back-up modes.

Shared Data Processing will exchange data using satellite communications, with initial operations among the three centers commencing in 1985.

9. Data Users

The sensors and supporting systems of NOAA's polar-orbiting and geostationary meteorological satellites were selected to emphasize atmospheric and water surface observations. The data they provide can be, and are, put to other uses than Earth environmental observation and prediction.

A small fraction of NOAA-processed environmental satellite data is used in an operational time frame by other Federal agencies and commercial interests. By building ground stations to take advantage of the continuous data broadcasts provided by these satellites, some foreign entities and nations copy and use small data segments for their own purposes. A large number of foreign governments also use satellite products incorporated into WMO GTS data dissemination broadcasts.

NOAA archives most of the satellite data products that it produces; these are provided to users upon payment of fees covering reproduction and handling costs. A growing industry exists in the United States that provides its customers with tailored environmental advice, analysis, and forecasting. Some NOAA satellite information is used [illegible] industry, in the form of primary and follow-on products. This [illegible] mostly uses data from the geostationary (GOES) system for [illegible] observations and short-term forecasts. TV weathercasters are prominent users of GOES imagery, received from either NOAA or commercial sources.

New uses of these data are possible, and some are being implemented. Assessing crop conditions and vigor over large areas is one such application now being explored by the Government and offered as a service by commercial concerns.

Environmental observation, analysis and forecasting, including activities relating to climate, are well-established and almost universally government activities. Universities and research institutes participate in the research and development phases, but governments are in the business of round-the-clock concern for the safety of their populations and the protection of their national resources. Broad forecasts, warnings of severe weather events, and information about navigable/coastal water conditions satisfy most requirements.

Construction firms use weather data. Large agra-businesses use inhouse or contract services which depend on conventional weather observations for the most part. The introduction of satellite data here has been fairly slow. Small agra-business and family farm interests are beginning to cluster and contract for environmenal support services offered by specialized service companies.

Ocean interests, including transport, energy, engineering, fishing, and Commercial aircraft operators are end-users now and are seeking more satellite products and represent an area in which market expansion is possible. Although most local governments use private forecasters for advice on snow removal operations, few of them use such services for water management purposes. The potential for service growth in this area, with satellite data, appears high.

Chapter VI discusses and tabulates the variety of current and projected environmental satellite data users. In summary, the U.S. Government is currently the dominant user of real-time environmental satellite data. The best judgment available suggests that the number of users in the Federal government could double before the end of the century, but only if a marketing program targeted towards them was undertaken.

B. Landsat

1. Historical Review

Over the past decade, the Landsat series of satellites have provided observations that have improved our ability to monitor and understand the dynamics and character of the various features and materials covering the surface of the Earth.

The platforms of Landsats 1, 2 and 3 are essentially identical. Each weighs about 953 kilograms (2,100 pounds), has an overall height of about 3 meters (10 feet), and a width of about 4 meters (13 feet)

when the solar cells, which provide power for the systems on board, are extended. The predicted life span had been a year, but it was not until almost five and a half years of operation had elapsed that technical problems led to the shutting down of Landsat 1 on January 6, 1978.

While Landsat-1 was still in orbit, Landsat-2 was launched on January 22, 1975. Landsat-3 was launched March 5, 1978.

Landsat 1 has ceased to function. Landsat-2 has a degraded attitude control system, and operational use of this satellite is marginal. Landsat-3's sensors are degraded, and data taken from them currently are far from optimum for many users. Landsat-2 and -3 will be placed in a backup (non data-collecting) mode at the end of March 1983.

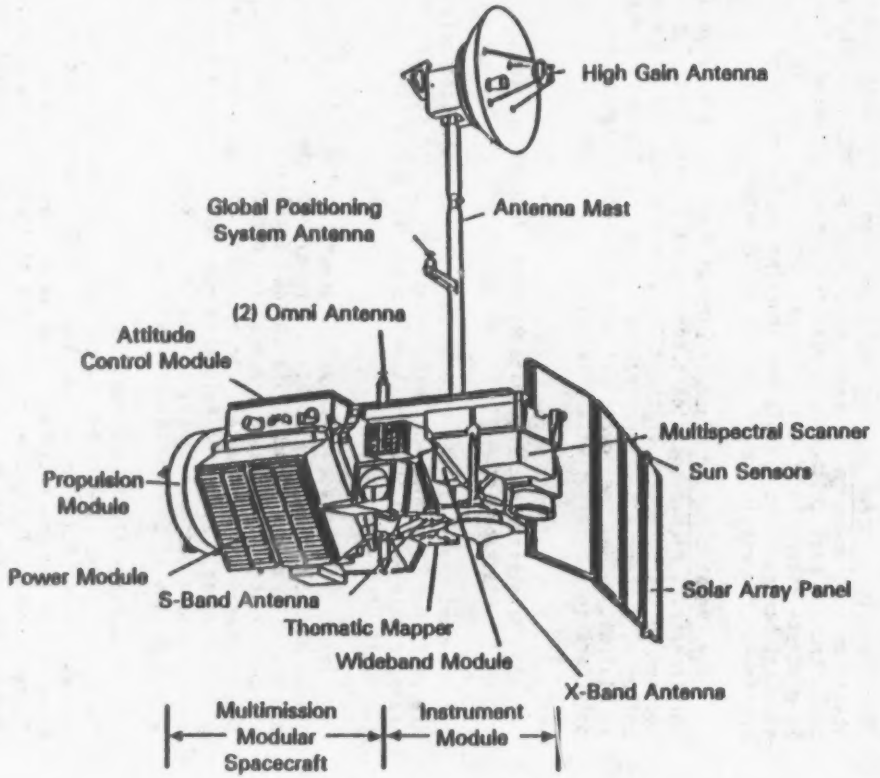
On July 16, 1982, Landsat-4 was launched into a polar orbit with an altitude of 705 kilometers (438 statute miles). It circles the Earth every 98.9 minutes. The spacecraft images the same 185 km (115 mi.) swath of the Earth's surface only once every 16 days. Thus, it takes 16 days to provide full coverage of the Earth's surface (except for a small area immediately around the poles).

Landsat 4 became the first interim operational land remote-sensing satellite when NASA turned it over to NOAA on January 31, 1983. NOAA is responsible for controlling the spacecraft, scheduling the use of the sensors, and processing and distributing data through the Department of the Interior's Earth Resources Observation System Data Center in Sioux Falls, South Dakota. A follow-on satellite (Landsat-D') is available to replace Landsat-4.

2. Characteristics of Landsat 4 (and D')

Landsat-4, a new, modular-design spacecraft, consists of NASA's standard Multimission Modular Spacecraft and a mission-unique instrument module. This basic spacecraft bus includes the attitude control, communications, data handling and power subsystems. The instrument module includes a Multispectral Scanner, a new Thematic Mapper sensor, a wideband communications subsystem, high-gain and other antennas, and a solar array capable of generating two kilowatts of power. The spacecraft also is designed for Space Shuttle launch and retrieval. The satellite configuration is designed for a three-year mission life.

Landsat-4 Flight Segment



The Multispectral Scanner (MSS) has been the primary Earth-observing instrument on Landsat spacecraft. The MSS is a radiometer, an instrument that collects and measures energy reflected or emitted in discrete intervals of the electromagnetic spectrum. It has four spectral bands in the visible and near-infrared portions of the spectrum. The resolution of the MSS is 80 meters.

The Thematic Mapper added to Landsat 4 and D' is a seven-band multispectral, high-resolution scanner with 30 meters resolution as opposed to the 80 meters of the MSS. Like the MSS, the instrument collects, filters and detects radiation from the Earth in a swath 185 km (115 mi.) wide, then quantizes and multiplexes signals from its detectors into a serial data stream for transmission.

3. Satellite Tracking, Data Receipt, Processing, and Distribution

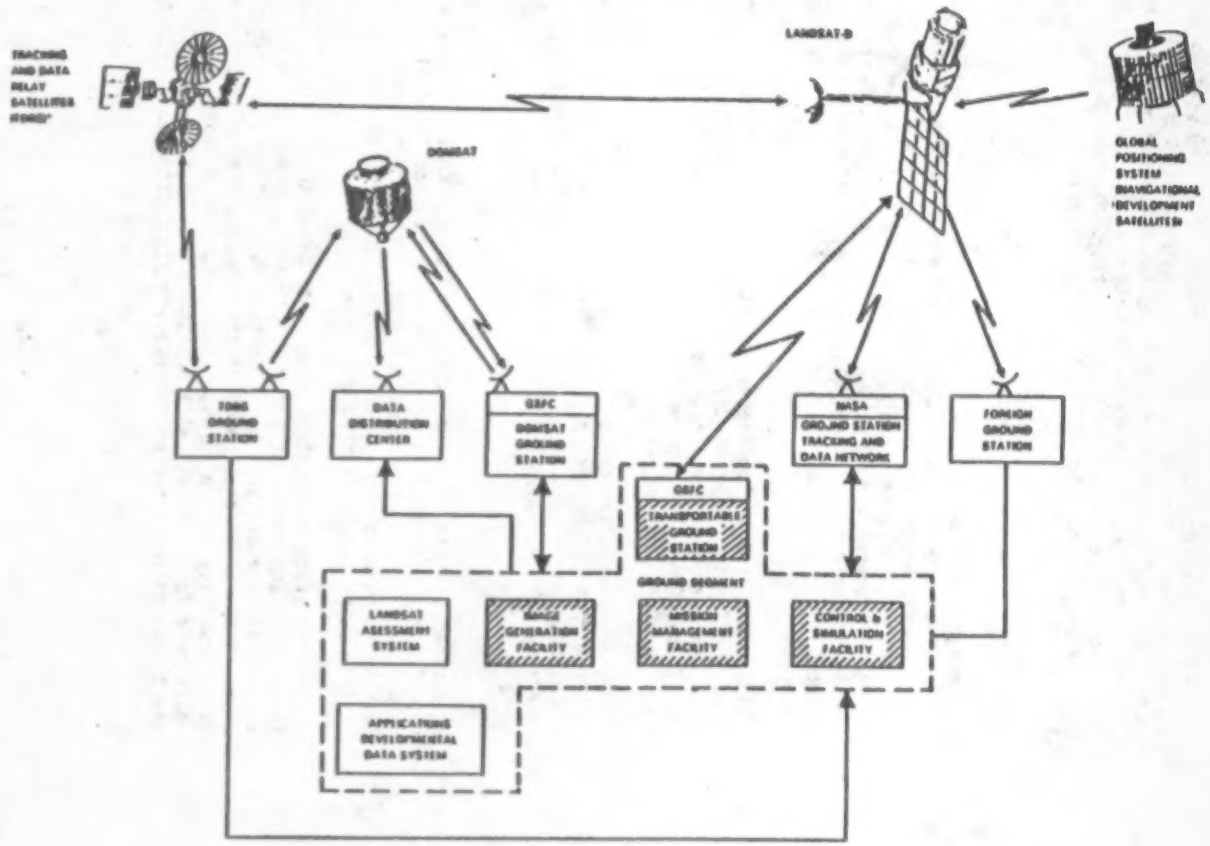
Landsat tracking, operational control and image data acquisition are performed by a NASA worldwide network of ground stations and the Transportable Ground Station at NASA's Goddard Space Flight Center (GSFC) in Greenbelt, Md.

Image data are acquired by NASA ground stations in Fairbanks, Alaska and Goldstone, California and relayed to the Landsat ground processing system at Goddard via the RCA Satellite Communications (SATCOM) System. Data also are acquired directly by the Transportable Ground Station at the Center. In addition, foreign ground stations in Brazil, Sweden, Japan, and Australia read out and record image data onto standard computer tapes, then ship the tapes to the Landsat ground system at Goddard for processing.

NASA currently is implementing a new Tracking and Data Relay Satellite System (TDRSS) to provide telecommunications services between low-orbiting satellites and a single readout station. It consists of two geostationary relay satellites (41°W and 171°W) in radio range of a ground acquisition station at White Sands, New Mexico. The system also includes two spare satellites, one in orbit (171°W), and one ready for rapid replacement launch.

When the NASA TDRSS becomes operational, it will be used for Landsat spacecraft command, tracking, and image data acquisition. The current ground-based tracking network will no longer be needed for worldwide image coverage and will be closed. Image data will be relayed from the White Sands facility to the Landsat ground system at Goddard via the RCA SATCOM System.

Major Elements of the LANDSAT System



TDRSS-A is scheduled for launch in April 1983 and will be in orbit and available for test support to Landsat-4 in June 1983. Because TDRSS will not be operational during the early phase of the NOAA Landsat program, worldwide image data will not be received in the United States. Use of foreign ground stations for such data collection is planned until TDRSS is fully operational.

4. Foreign Ground Stations

Foreign ground stations have been a part of the Landsat program since its inception in 1972. Under an agreement with NASA, they receive Landsat image data directly when the spacecraft is in view of the station. This decentralized approach allows maximum user access to the system. NOAA will continue direct readout services to foreign stations during its operational Landsat program under agreements currently being negotiated to replace the existing NASA agreements.

These stations are purchased, maintained and operated at the cost of the foreign governments. Today there are foreign ground stations receiving, processing, and distributing Landsat data in Asia, Africa, Europe, South America, North America, and Australia. The stations are located in:

Mar del Plata, Argentina	Fucino, Italy
Alice Springs, Australia	Tokyo, Japan
Cuiaba, Brazil	Hartebeestohek, South Africa
Prince Albert, Canada	Kiruna, Sweden
Hyderabad, India	Bangkok, Thailand

Another station is being established in Djakarta, Indonesia. Also, NASA has concluded an agreement for a station in Beijing, China, although it has not yet been established. Other countries interested in establishing stations include Romania, Upper Volta, Ecuador, Pakistan, Zaire, Saudi Arabia, and Kenya.

Foreign station operators have contributed to the widespread international acceptance of the U.S. Landsat program, which in turn has increased the utilization of Landsat data products worldwide. As distribution facilities, ground stations have worked with the remote-sensing community in their respective regions to promote the use of Landsat data for a variety of applications and to stimulate the present international market for land-remote sensing satellite data.

Table A-3: Station Status

COUNTRY	YEAR OPERATIONAL	MSS RECEIVING & PROCESSING CAPABILITY	TOTAL NUMBER (EST.) MSS SCENES ACQUIRED	TM RECEPTION CAPABILITY	TM PROCESSING CAPABILITY
ARGENTINA	1980	On-Line	6,114	TBA	TBA
AUSTRALIA	1980	On-Line	40,825	TBA	TBA
BRAZIL	1974	On-Line	118,604	On-Line	3/83 (limited processing)
CANADA	1972	On-Line	250,123	On-Line	12/82 (limited processing)
CHINA (under construction)	1984	1984	--	1984	1984
ESA 2 (STATIONS) FUCINO KIRUNA	1976 1979	On-Line On-Line	220,083	On-Line 5/83	8/83 5/83
INDIA	1980	On-Line	47,570	12/82	1/83
INDONESIA (under construction)	1983	1983	--	TBA	TBA
JAPAN	1979	On-Line	28,045	4/83	9/83
SOUTH AFRICA	1980	On-Line	11,031	TBA	TBA
THAILAND	1982	On-Line	8,111	TBA	TBA

TBA - To Be Announced

During the period of NOAA Landsat operation, present and planned foreign stations will:

- Provide revenues through payment of access fees to contribute to NOAA's cost recovery efforts;
- Increase the pool of available, worldwide real-time and retrospective data until the new tracking and data relay system (TDRSS) becomes operational;
- Maintain a U.S. presence around the world to parallel the French marketing efforts to establish ground stations for their commercial land remote-sensing satellite program;
- Provide countries that operate stations with an incentive to market Landsat data within their respective regions;
- Provide back-up data acquisition capability when TDRSS is unavailable; and
- Reduce NOAA operating costs and data prices for customers by limiting the need to use and pay for NASA TDRSS services to acquire data.

For FY 1983, revenues from foreign ground stations to NOAA will total approximately $6 million. As more stations upgrade their facilities for TM data reception, NOAA receipts should increase.

While station revenues contribute to offsetting the cost of operations, an equally important factor is the potential role foreign facilities could play in the future viability of commercial land remote-sensing satellite systems. Foreign ground stations contribute to market stimulation. Additionally, many stations currently are taking a more commercial approach to their activities.

Brazil, for example, recently raised data prices to reflect more closely the actual cost of operating and maintaining its Landsat facilities. In Canada, efforts are underway to explore the possibility of commercializing the product generation and distribution segment of its receiving and processing facility. Just recently, the ESA (European Space Agency) Council has directed Earthnet, ESA's Landsat management organization, to operate on a cost-recovery basis within the next three years. If this goal is not met, efforts will be made to transfer parts or all of the Earthnet operations to a private operator.

Many of the stations also have embarked on aggressive programs to improve products and services to their users. South Africa has implemented a series of remote-sensing workshops held in neighboring countries and designed to increase awareness of the potential benefits of remote sensing. Canada now is in the final stages of introducing, as standard items, geocoded data products. Additionally, Canada has for many years been providing the shipping industry with inexpensive, quick-look products, available within three hours of acquisition, which are used for ice monitoring. This station now is also offering selected MSS scenes on loan to universities for use in remote-sensing training.

Earthnet is managing an experimental program whereby quick-look imagery is transmitted to selected users in Europe via communications satellite within hours of acquisition. Based on this imagery, a user is able to determine immediately whether or not that scene is useful. Such a service can be invaluable to the near real-time user.

This is not to imply that all stations are in a position to market Landsat data aggressively. Many countries operate these facilities primarily to support ongoing government programs. Some stations serve a prestige function for their respective governments.

5. The Landsat Ground System

The Landsat 4 Transportable Ground Station (TGS) located at the Goddard Space Flight Center in Greenbelt, Maryland tracks the Landsat-4 satellite and receives, processes, and distributes data transmitted by the spacecraft. The station consists of an electronic equipment van and 10-meter receiving antenna that can be transported to another location with the system intact.

The Mission Management Facility consists of hardware, software, operations, and procedures to provide user-request processing, image data production management, management reporting, data base management, ground control point library generation, inventory control, and ground segment management. The Mission Management Facility data base is the repository of all information required by the Landsat Ground System.

The Control and Simulation Facility (CSF), also located at NASA's Goddard Space Flight Center, is a dedicated control center with the capability to operate two satellites. The Facility's mission is to:

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- o Coordinate the scheduling of ground resources for acquisition of image data and for communicating with, controlling and maintaining the Flight Segment;
- o Provide off-line mission planning and analysis;
- o Control, monitor, and analyze satellite performance;
- o Coordinate and direct TM and MSS operations for the acquisition of image data and delivery of the data to the Image Generation Facility.

The Image Generation Facility (IGF) receives and processes raw MSS and TM instrument data to produce film and digital products to meet established performance requirements. It consists of a Data Receive, Record, and Transmit Subsystem, an MSS Image Processing Subsystem, a TM Image Processing Subsystem, and a Payload Correction Processing Subsystem. There are distinct image processing subsystems for MSS and TM to provide complete separability of MSS and TM processing. The Mission Management Facility provides process control for each image processing subsystem.

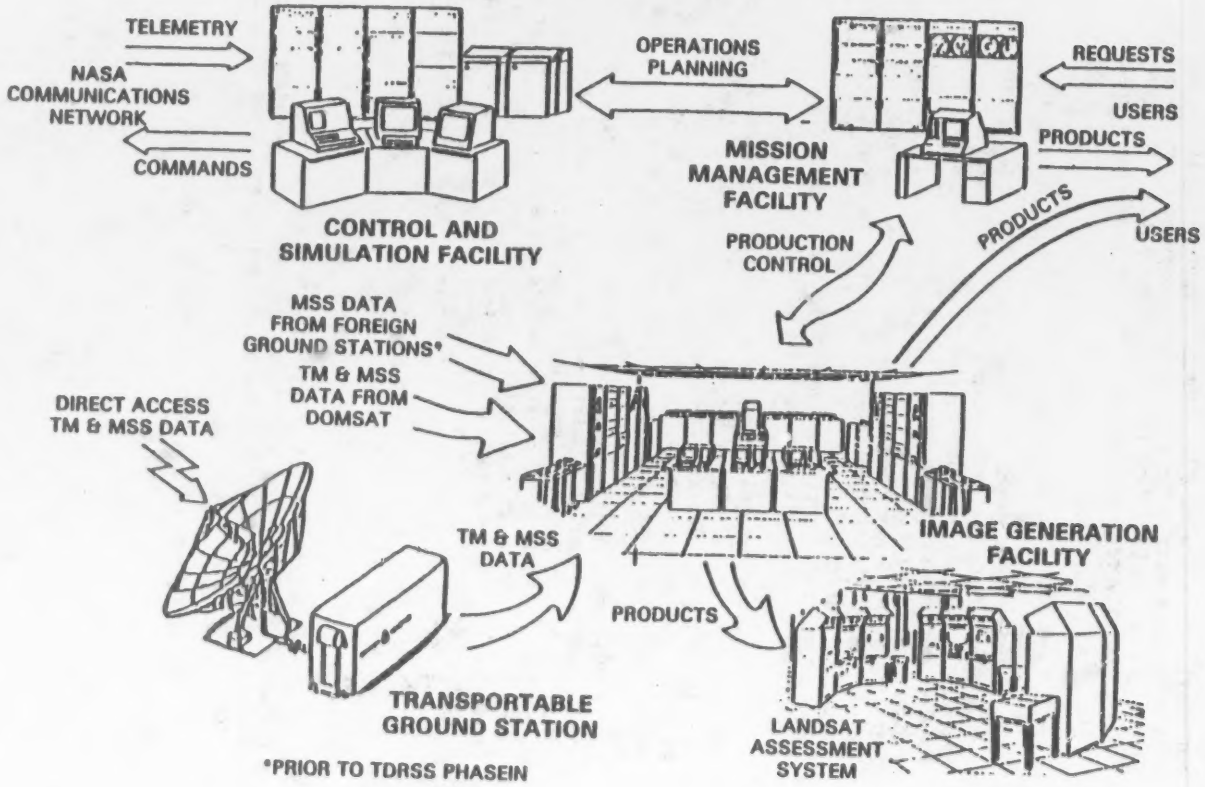
The MSS processing element of the Image Generation Facility will be used operationally. The TM element initially will be used in an R&D mode and will be made operational after the TM sensor and its performance are characterized by NASA.

The MSS Image Processing Subsystem processes the image data into the required archival format by extracting information necessary to compute both radiometric and geometric corrections, correcting the data, and appending the geometric correction data to the archival output.

The Payload Correction System processes spacecraft attitude and ephemeris data to create geometric correction functions that define corrections for systematic errors in the imagery. These corrections also are appended to the raw MSS data, which then are transmitted via the RCA Satellite Communication System to the EROS Data Center in Sioux Falls, South Dakota. At the Center, the data are copied onto high density recording tapes, which are placed in an indefinite archive.

The TM processing element of the Image Generation Facility is handled differently than the MSS element. Where MSS data are transmitted without incorporation of radiometric or geometric corrections, TM data are processed to include the corrections. The resulting

Landsat
Ground Segment



reformatted data are used to generate computer compatible tape copies of the TM image data. The high density computer compatible tapes then are mailed to the EROS Data Center in Sioux Falls. The current processing facility can only handled a limited number of scenes.

6. The EROS Data Center

The Department of the Interior's Earth Resources Observation System (EROS) Data Center in Sioux Falls, South Dakota processes and distributes Landsat data under reimbursable arrangements with NOAA. The Center provides access primarily to Landsat imagery, aerial photography acquired by the U.S. Department of the Interior, and photography and imagery acquired by the National Aeronautics and Space Administration (NASA) from research aircraft and from Skylab, Apollo, and Gemini spacecraft. The primary functions of the data center are data storage, reproduction and dissemination in response to user requests, and user assistance and training.

At the heart of the Center is a computer complex that controls a data base of over 6 million images and photographs of the Earth's surface features. The computerized data storage and retrieval system is based on a geographic system of latitude and longitude, supplemented by information about image quality, cloud cover, and data type.

A customer's inquiry about availability of remotely sensed data may be about a geographic point location or a rectangular area specified by latitude and longitude corner coordinates. In conducting a geographic search based on a customer's request, the computer will print out a listing of available imagery and photography from which the requester can make a final selection. Receipt of a prepaid order initiates processing. Funds collected from the sale of Landsat data will be used to offset the costs incurred by NOAA in operating the system.

7. Landsat Data Applications

Early uses of Landsat imagery led to the discovery of unknown water sources in arid regions, unexpected geological and geographic features, and the inroads that man was making on remote, environmentally fragile areas.

The advantages of the view provided by Landsat Multi-spectral

Scanner are that it shows a large area (185 km x 185 km) in a single frame, provides good detail (80-meter resolution), and lets the viewer examine the details in four spectral bands -- two visible, two infrared. In the visible spectrum, different bands emphasize water, Earth clays, vegetation, snow/ice, and other surface features. In the infrared band, various surface materials reveal characteristic signatures, some of which are very strong and distinct. Interpreters of MSS information, for example, can use a green-band image to detect an area of vigorous vegetation, then use an infrared image to determine the plant type.

The new Thematic Mapper (TM) instrument aboard Landsat 4 (and also Landsat D') increases the advantages of land satellite sensor observations by providing data in seven spectral intervals -- visible, near-infrared, and thermal infrared -- and by providing 30-meter resolution data in all except the thermal infrared (120-meter resolution) channel. The discussion of MSS data applications in the following paragraphs can be extrapolated to TM data applications, given that the user benefits from the higher cost of obtaining the much higher information content of TM data. The TM is still in R&D stage and will become operational in 1985.

a. False Color Imagery

Imagery applications of Landsat data can be expanded by using defined rules to sum the strengths of the signals received from an Earth location in two or more of the spectral bands for which measurements are available. Usually, a specific color is assigned to each value. Thus, a color image is produced, and a color-guide may be used to interpret the results. Such image products are referred to as "false color" images, because the investigator usually selects strong colors to highlight the most important features of the particular application, and the final image product does not show natural Earth colors.

False color Landsat imagery also can be presented on video screens. Equipment to do this is readily available and much of it is user-friendly. It usually includes a capability for blending data from other sources with Landsat data.

b. Computer Processing

In many Landsat applications computer processing and interpretation of data are used to obtain the information needed. Machine processing is usually selected because of cost considerations, timeliness factors, the magnitude of the task, or the degree of

detail required. Programming for these applications provides the decision logic that allows the measurements made by the sensor to be interpreted in the context of what is known about the ways that Earth materials reflect and emit spectral energy. In the case of a Thematic Mapper computer application, for example, one sensor band could be used to distinguish soil from vegetation, another to confirm a healthy green reflectance from the vegetation, a third to detect chlorophyll absorption characteristics of the given plant species, and a fourth to measure the vegetation moisture present. The output of this analysis could be the location, extent, relative vigor, and relative abundance of the species of food crop being assessed. Adding other bands to the process would refine the interpretation.

Landsat applications methods in agriculture and geology share a move toward computer data handling that is both more rapid and more universal than in most other disciplines. The interpretation refinements that human intelligence brings to these applications are becoming reserved for those areas and instances where machine processing flags the high probability of discovery or some other key indicator. The technological advances made in these computer applications are smoothing the way for other specialists who have not yet felt the need for using computers in their Landsat analyses.

c. Data Applications Categories

It is convenient to group users of satellite remotely sensed land data into three applications categories, although the groups do overlap and few practitioners limit their attention to one activity area. The renewable resources group includes the variety of users concerned with food and fiber crops, Earth soils, forests, and rangelands. Non-renewable resources users are concerned with geologic structure and landforms, lithology, thermal and geobotanic anomalies, topography, Earth gravity fields, and Earth magnetic fields. In the planning and environmental management group are included users interested in land use and cover, coastal and near-shore conditions, wildlife and its habitats, all aspects of hydrology, environmental pollution, tides and bathymetry, and episodic/catastrophic events.

(1) Renewable Resources Applications

Crop assessments and predictions are the most evident applications in the renewable resources area. Landsat data are used to detect the onset of crop stress, revealing not only disease and weather or insect problems, but also such things as malfunctions in center-pivot

irrigation systems. Buyers of crop futures include derived Landsat information in their market assessments and international farming interests use the information to make crop selections and planting-time decisions.

Forest interests use Landsat products to monitor the condition of their holdings, to make economic judgements about harvesting, and, in a few known cases, to determine payments to the owner based on surface samplings of tree extractions that can be correlated with Landsat observations.

Soil scientists, resource managers, and engineering interests use Landsat data to determine the type and extent of surface clays. At a time when the annual national (and global) loss of top soil is being recognized for the threat it represents, detecting changes in topsoil patterns and observing sediment burdens in run-off waters is a critical Landsat application. In other applications, the location of specific types of surface materials is the objective. Landsat data are used to locate surface and near-surface deposits of building materials that are proximate to major construction sites. Engineering applications advantages increase with the scale of the project. Landsat cuts down reconnaissance time, allows earlier and better estimates to be made of the scope of the task, permits improved planning of on-site activities, and provides engineering data that aids in site selection and project design.

(2) Non-Renewable Resources Applications

The leading use of Landsat products in non-renewable resources applications is the mapping and interpretation of geological structure. The end-purposes of these applications are frequently those associated with the search for hydrocarbon energy sources and critical/strategic minerals. The geologists who do this work employ all possible information resident in Landsat data for their interpretations. They deduce landform, surface fractures, and surface clay distributions as a first step, then add the information about trace elements, outgassing, and moisture that is revealed by vegetation anomalies near sites of interest. Using data collected at different times of the year, they are able to include the information that sun-angle and temperature changes provide about surface conditions. By such a detailed process, they are remarkably successful in determining the gross structure and the most likely details of the geology of the region. They gain for their organizations marked reductions in the huge costs of air and ground surveys that usually are required to make commercially valuable discoveries.

(3) Planning and Environmental Management Applications

Except in the cases of land-use classification and hydrology, the planning and environmental management segment of the Landsat user community is somewhat fragmented and uneven in its activities. Major pollution events are episodic, wildlife habitat investigations suffer from fluctuating budgets, and coastal zone concerns (except for planning) recently have begun to follow the pattern of severe storm/disaster aftermath assessments.

Land-use applications center on classifying and detecting changes in land cover. The end-user frequently is a governmental planner or manager. Using Landsat products to assess an existing problem or to detect the onset of a new one is relatively easy. The planner/manager, however, needs the full range of information from Landsat and other sources to possess a sufficient technical base upon which to develop socially and politically acceptable solutions. As a simple example, the march and destruction of trees by gypsy moths has been monitored routinely by Landsat for some years. Measuring tree loss is not enough, however. Planners in the path of this march also needed Landsat information about population concentrations, river drainage, and abundance of threatened tree species.

The complexity of land management activities calls for the full exercise of Landsat data in common cases, such as in managing the loss of farm lands to dwellings or industry or roads. Landsat data are used to trace the rate of loss of farm land, identify areas not suitable for farming but appropriate for other uses, assess the ability to support expansion areas with road networks and utility services, estimate the impact of changed land use on drainage patterns and flood plains, and discover environmental impediments not previously suspected.

Landsat planning and environmental management applications are conducted on a number of scales in the United States and in foreign countries. U.S. coverage applications programs tend to be centered in State and Federal agencies that have responsibilities for broad geographic areas. Some counties have on-going programs, but few cities. Although counties and cities now look to their State governments for much of the Landsat information they use, they are expected to be more independent when Thematic Mapper data products covering their locales become available and provide them with the finer resolution they need for their purposes. While some foreign governments conduct their own Landsat planning/management applications programs, many have elected to contract with U.S. firms for this

service. These contracts have ranged from whole-country surveys of land use classification to very local development projects.

8. Landsat Data Users (Appendix B profiles data users in greater detail.)

A decade of Landsat research, applications development, and user stimulation programs has produced only a few thousand individuals or entities, worldwide, that can be classified as Landsat data users. Among these are many that are casual or uncommitted.

Some potential users remain intimidated by the high technology applications that generally are reported only by specialists in professional publications. Many regard Landsat data as non-competitive with data they can obtain from other sources, mostly for reasons of reliability, timeliness, or cost.

U.S. and foreign governments, both national and local, form the largest block of users. Landsat inventory applications are a prime interest of governments: food and fiber crops, water sources and quality, land availability and utilization, mineral and energy resources, transportation routes, and population concentrations are some of these.

Detecting changes in these inventories with time is a requirement, as is using Landsat data to help assess the impact of events such as floods, oil spills, desert encroachment, fire-farming, severe coastal storms, and crop failures. Countries that are less-developed and less-surveyed gain significant mapping advantages from Landsat data, which can result in improved planning for social

and economic programs. As the level of the using government agency becomes more local, the need for finer resolution grows and the more valuable Landsat data become as a tool for identifying critical areas for investment in expensive aircraft or surface surveys.

In all Landsat applications, the benefits of using Landsat data as one of the components of a multi-component data base are recognized. Government users tend to develop a data base approach to Landsat applications.

Assistance in using Landsat technology has been provided to developing nations by technically more advanced countries. This assistance has ranged from the total underwriting of applications projects, through equipment donations, to training programs. Many applications projects for or in foreign countries are conducted under contract, with U.S. contracting firms being the major suppliers of services. It generally is agreed that the non-U.S. market is the most expandable market for Landsat data, products, services, and equipment.

Governments have provided much of the leadership for the research and development needed to make practical use of Landsat data. Universities and research institutes, either together with or independent of governments, continue to be centers of advance in the work and spread of the technology. A large proportion of the Landsat data user population is located at universities and research institutes. Although circumstances do not allow these academic users to build the Landsat product sales volume directly, they provide the methodologies and the practitioners that make sales possible.

The advent of Thematic Mapper (TM) data from Landsat 4, with much higher information content than Multi-spectral Scanner (MSS) data, provides a continuing challenge and need for university participation in development programs. NOAA and interested universities have been looking for ways to reduce the effect of higher data prices on these programs.

Commercial and industrial users of Landsat data generally are represented by mineral and energy companies, firms consulting on geological exploration, engineering and construction companies and their consultants, timber producers, fiber and food crop interests, land-use planners, and hydrological consultants. Some novel and other users are present, but in small numbers.

As further explained in Appendix B, mineral and energy interests have tended to be the dominant element in this user sector, since Landsat data became available at about the same time that the energy crisis of the early 1970's claimed global attention. Large dollar amounts are involved. Landsat data can be used to shorten the expensive search for high probability energy areas.

A decrease in Landsat data purchases by energy companies because of the current slowdown in the search for new energy deposits is not evident yet. It can be presumed that any such effect would be temporary, and the long-term expectation should be for continued growth, with bursts of rapid growth probable as new user companies and new energy problems emerge.

APPENDIX B. DATA MARKETS

A. Environmental Satellite Data

1. Introduction

While there is considerable interest and a very broad audience for many meteorological satellite products, there has been no concerted attempt actively to market those products.

A review of present and anticipated meteorological satellite products and services with emphasis on their potential commercial value follows.

TIROS-N polar orbiting satellite data is transmitted to the NOAA Central Computer Facility where it is accessed by the National Weather Service for use in their forecast models and other products.

On an orbit-by-orbit basis, the Solar Environmental Monitoring (SEM) instrument data from TIROS-N are transmitted to ERL, Boulder; data from the Data Collection and Location Platform instrument provided by Service ARGOS are relayed to the Service ARGOS facility in Toulouse, France, and the data from the Stratospheric Sounding Unit instrument provided by the United Kingdom are relayed to the British Meteorological Service in Bracknell. In addition, processed satellite atmospheric sounding data and some National Weather Service (NWS) analyzed data fields also are transmitted to Bracknell. A new link is being established to transmit the next TIROS-N satellite (NOAA-E) Search and Rescue data to the U.S. Air Force at Scott Air Force Base, Illinois.

The geostationary satellite data are routed to two separate processing systems. One system is used for ingest, preprocessing and archive processing in preparing the data for further computer processing. The other system relays data over a direct microwave link to the remote site in the World Weather Building (WWB) in Camp Springs, Maryland. The National Weather Service's Washington Forecast Office and National Meteorological Center are collocated in WWB and can directly access the data and products.

The Department of Defense (DOD) receives all NOAA environmental satellite data either directly from the satellites or from the NOAA ground receiving stations. DOD presently maintains their own data processing systems; however, steps are underway to institute a shared NOAA/DOD processing system as discussed in Appendix A.

Even though the NWS and DOD comprise the major demand for environmental satellite data and their needs are met by the above systems, NOAA does provide methods for disseminating data and products to other current and potential users. These services are described in the following sections.

2. GOES-TAP Services

a. Program Overview

The GOES-TAP Program provides high quality satellite imagery to government and commercial users on a real-time basis. To receive satellite data, a user must acquire appropriate telephone communications, purchase or lease terminal display equipment, enter an agreement with the Government, and pay both an initial connection fee and annual service fee.

Satellite imagery is initially processed through the World Weather Building in Camp Springs, Maryland. The data are converted into an analog facsimile format and disseminated via private telephone lines to NOAA's Satellite Field Services Stations (SFSS). The SFSSs are located at Washington, D.C.; San Francisco, California; Honolulu, Hawaii; Kansas City, Missouri; Anchorage, Alaska; Miami, Florida; and New Orleans, Louisiana. These sites were selected due to their proximity to key National Weather Service (NWS) facilities and serve as major distribution points for NWS and GOES-TAP users.

Another method of receiving satellite imagery is to make a connection to a National Weather Service (NWS) dedicated telephone line. This method is termed WSFO-TAP (Weather Service Forecast Office Tap) and requires a written agreement with the NWS. There is no charge by the government for this service. Also, due to usually shorter telephone lines, the line cost is less. WSFO-TAP customers do not have the capability to select sectors and therefore receive only data selected by the WSFO.

b. Imagery Available

(1) Geostationary Operational Environmental Satellite (GOES)

In general, standard GOES visible sectors at 1-km, 2-km, and 4-km resolutions are produced during daylight hours. Equivalent infrared (IR) with the same geographical coverage at 7-km resolution is produced both day and night. Certain standard sectors, as designated by the NWS Regions, are produced on a "ping-pong" schedule (i.e., VIS, IR, VIS, IR) with different

enhancement curves throughout existing daylight hours. Seasonal adjustments are implemented by appropriate SFSSs for changes from VIS to IR and IR to VIS.

All SFSSs have dedicated sectorizors with image flexibility (floater) except Anchorage. The floater product schedule--including locations, resolution, VIS, IR, and enhancement--is determined by each SFSS. All users can copy these floaters, if they desire, but must contact the appropriate SFSS to obtain the schedule or product availability for any given data period.

(2) Flash Flood Support

This support requires production of 1-km equivalent IR sectors with image enhancement depicting thunderstorm intensity. Whenever conditions indicate the possibility for flash flooding, the appropriate 1-km standard sector (from either the GOES East or GOES West) covering the threatened area is programmed to produce 1-km IR with an appropriate image enhancement. Users copying the routine standard 1-km sector then will be alerted to the possibility of a flash flood situation.

(3) NOAA AVHRR

Advanced Very High Resolution Radiometer (AVHRR) imagery from NOAA's polar-orbiting satellites is available to some GOES-TAP customers. These data, although spatially and temporally limited, have resolutions of 1-km in all wavelength channels. AVHRR data have proven to be a very useful diagnostic tool in the fields of meteorology, oceanography, and hydrology. In addition, the Department of Agriculture uses AVHRR data for crop assessment purposes.

(4) Geostationary Meteorological Satellite (GMS)

Japan operates one geostationary satellite, GMS, which has a satellite subpoint at 140°E. This position gives GMS an areal coverage from the South Pacific to Siberia, and from Hawaii to India. Limited amounts of GMS data are available to GOES-TAP customers. GMS data are transmitted in WEFAX format.

(5) European Geostationary Meteorological Satellite (METEOSAT)

The European Space Agency operates a geostationary satellite, METEOSAT, which has a subpoint of 0°E. This position gives METEOSAT an areal coverage from the South Atlantic to Greenland and from Saudi Arabia to Brazil. This satellite offers visible, infrared, and moisture channel data. Limited amounts of METEOSAT data, also in WEFAX format, are available to GOES-TAP customers.

c. User Analysis (As of December 14, 1982)

(1) Current User Statistics

Table B-1:

Current Users

Private GOES-TAP Users	70
Federal Government Users (Non-NOAA)	83
NOAA Users	56
TOTAL	209

The private users include:

Universities	3
TV Stations (including cable)	39
Airlines	9
Private Companies	19
TOTAL	70

The Federal (non-NOAA) users include:

DOD	48
FAA	25
NASA	6
Other	4
TOTAL	83

(2) Three Year Trend (1980-1982) Analysis

Table B-2:

New Customers

Year	Private Users	Federal (non-NOAA) Users
1980	23	9
1981	13	12
1982	8	13

Table B-3:

New Customer Profile

1980 - 23 new GOES-TAP Users

TV and cable stations	11
Universities	1
Airlines	5
Private Companies	6

1981 - 13 new GOES-TAP Users

TV and cable stations	8
Universities	1
Airlines	3
Private Companies	1

1982 - 8 new GOES-TAP Users

TV and cable stations	6
Universities	0
Airlines	0
Private Companies	2

(3) GOES-TAP User Income Analysis

Table B-4:

GOES-TAP Revenues

	New Customer Connection Fees		Annual Maintenance Fees		
Year	Private	Federal	Private	Federal	Grand Totals
1982	$ 8,000	$13,000	$ 5,885	$ 2,608	$29,493
1981	13,000	12,000	6,031	6,482	37,513
1980	23,000	9,000	8,217	8,408	48,625

20-901 O - 84 - 56

As indicated in the totals, there has been a steady decrease in annual revenues over the past three years. Because the new customer initial connection fee is comparatively large ($1,000), the decrease in annual revenues is almost entirely due to a decrease in new GOES-TAP customers.

(4) Discussion of Trends

Private GOES-TAP Users

There has been a steady decline in new private GOES-TAP customers during the past three years. The primary reason appears to be the escalating costs of communications lines and the general state of the economy. Around 50-60 companies making inquiries this past year about GOES-TAP service have opted for other sources of satellite data such as WEFAX, WSFO-TAP or private companies offering data, due to the high cost of communications lines.

There has been a 15 percent decrease in the number of users served in the past two years. One example is a private firm in New England with GOES-TAP service from the Washington SFSS. The meteorologist from this firm indicated that line costs were the only reason the service was dropped. Their telephone costs were $800/month.

Federal (non-NOAA) GOES-TAP Users

There has been a gradual increase in the number of Federal GOES-TAP users in the past three years. This has been mainly the result of the USAF and the FAA expanding the use of satellite data to support their respective missions. The USAF and the FAA have indicated their plans to continue to expand their participation in the GOES-TAP program. This should result in a continuation of the current growth curve for Federal GOES-TAP customers.

Federal GOES-TAP customers have shown a 100 percent retention rate for the past three years. Two temporary Federal GOES-TAP activities have been established in the past three years. These have been 3-month temporary taps by the Department of Energy and Joint Special Operations Command, both at Honolulu. All GOES-TAP activities are unclassified; however, the use of the data may be classified.

(5) WSFO-TAP Analysis

As previously indicated, the National Weather Service manages the WSFO-TAP service. Currently there are approximately 470 WSFO-TAP outlets from 50 WSFOs. The WSFO-TAP program began in 1976, and there has been a steady increase of about 90 new users per year for the past three years. Most users are in the same city as the WSFO, thus incurring small communications costs. About 95 percent of WSFO-TAP customers are private users, and five percent are Federal (non-NOAA) users. Of the private users, about 70 percent are TV stations and the remaining are airlines and private companies. The U.S. Air Force is the major Federal user.

3. Direct Broadcast Services

a. Overview

Direct Broadcast Services refer to the capability of environmental satellites to send, and local users to receive, certain types of radio signals that can be converted into images or digital products and used to observe or measure cloud heights, types, or distribution; ice and snow cover; sea surface temperatures; and other environmental parameters. The local user community includes U.S. and foreign government and military agencies; academic, scientific, and commercial institutions; and radio amateurs. These users have established satellite direct broadcast receiving stations of one type or another in over 120 countries; world-wide dollar investment in ground receiving equipment is estimated at between $130M and $150M. Since the introduction of direct broadcast services in 1963, no legal, political, or financial obligations have been placed on users requiring them to report the existence of a receiving station or their use or distribution of products. Most users do, however, report to NOAA the existence of their station, in order to receive satellite status reports and operational or planning information from NOAA.

The ability of the United States to provide direct broadcast services long has been hailed as one of its most successful demonstrations of peaceful uses of outer space.

Direct readout services* specifically include:

APT - Automatic Picture Transmission
HRPT - High Resolution Picture Transmission
DSB - Direct Sounder Broadcast
VISSR - Visible Infrared Spin-Scan Radiometer
WEFAX - Weather Facsimile

The first three originate from polar satellites, the last two from geostationary spacecraft. Table VI-5 shows the distribution of stations by type and organizational affiliation.

With the exception of the radio amateur community, the largest number of users of direct broadcast services are foreign meteorological agencies and U.S. military ships and stations outside the country. Commercial interest in direct broadcast services is confined to a very small segment of the user community, largely manufacturers and vendors of direct broadcast receiving equipment. Only in the WEFAX area does there appear to be the potential for an expansion of commercial interest and involvement in direct readout data reception and use.

b. History, Development, and Trends

(1) APT -- Automatic Picture Transmission

APT services first were introduced as an experiment on TIROS VII in 1963. At that time, seven stations in three countries had the capability to receive imagery. Today, over 800 stations in more than 120 countries have the capability to receive, and knowledge to use, APT imagery.

APT signals are transmitted continuously from polar orbiting satellites and can be received by any station, anywhere in the world, when the satellite comes within radio range of that station--usually twice during the daytime and twice at night.

* Data collection from remote platforms via the ARGOS system or the geostationary satellite systems are not considered direct readout services in the context of this section.

TABLE B-5

Direct Readout Stations

Service/Sensor	United States				Foreign				TOTALS
	Government/Military	Academia	Commercial	Amateur	Government/Military	Academia	Commercial	Amateur	
APT	58	12	5	187	456	51	15	98	884
HRPT	23	1	0	0	46	2	4	0	76
DSB	2	0	0	0	3	0	0	0	5
VISSR	8	1	2	0	6	0	0	0	18
WEFAX	23	9	17	39	57	3	8	5	161

The signals are derived from the operation of the Advanced Very High Resolution Radiometer (AVHRR), a continuous-scanning, five-channel instrument. Two channels are re-formatted aboard the spacecraft, panoramic distortion is largely removed, and the data are sent as a VHF signal at a reduced resolution (4 km) to maintain bandwidth constraints. When the satellite passes directly overhead, a local APT station can receive an image of an area roughly 3,000 nm in length and 1800 nm wide.

Because it is a VHF signal, receiving equipment is relatively inexpensive and simple to operate and maintain. The IR and visible channel data, whether reproduced on the ground as an image or converted into a digital product, provide a good overview of significant meteorological, hydrologic, and oceanographic features. It is this combination of low equipment costs and data versatility that have made APT reception so attactive to so many organizations and individuals involved in environmental observing and forecasting. Commercial use of APT, however, has been exploited by less than a dozen companies, primarily those involved in polar exploration -- an area not viewed by geostationary satellites -- and at remote sites where conventional weather data are not readily available.

The present trend in APT data acquisition is not toward more stations, but rather toward upgrading existing stations to take fuller advantage of the high quality signals transmitted by APT-equipped satellites. Most of this development will involve overseas stations, whether operated by U.S. or foreign agencies. In the United States, there is little demand for APT products because of the availability of satellite data via landline systems.

(2) HRPT -- High Resolution Picture Transmission

High Resolution Picture Transmission services developed as an outgrowth of the APT program. As users of APT data became more proficient in understanding and interpreting what they saw, the demand for higher quality data increased. Thus, the Very High Resolution Radiometer, and later the Advanced Very High Resolution Radiometer, were developed.

HRPT services are derived from the operation of the Advanced Very High Resolution Radiometer instrument, a line-scanning device which operates continuously as the satellite circles the

Earth. The AVHRR is sensitive to five special regions, all of which are transmitted in real time as part of the S-band downlink system, as digital data, at full (1.1-km) resolution.

The AVHRR is designed to improve the capability to obtain accurate sea surface temperatures and to aid in differentiating clouds from solid or melting ice and snow. Most ground stations using HRPT data have rather sophisticated computer processing equipment to position accurately picture elements and to process the digital AVHRR output.

The prototype of the AVHRR, the Very High Resolution Radiometer, was first flown on the NOAA-2 satellite, launched in October 1972. As of October 1982, 76 HRPT stations were in operation. Of this number, five are maintained and operated by commercial firms that build and market such stations. Two were designed and are operated by academic institutions -- one in Scotland, the other in West Germany. The remaining 71 stations are operated by or for government or military organizations, including 18 for U.S. military forces.

The trend in HRPT stations acquisition is toward procurement of HRPT equipment by government and military agencies overseas. The high resolution imagery generated from the digital output of the AVHRR provides rather precise positioning of cloud, snow, and ice features in support of aircraft or ship operations and general regional weather forecasting. Since HRPT data cover areas immediately near the receiving station, and not global features, commercial uses are limited, and primarily involve manufacturers of HRPT related equipment.

(3) DSB -- Direct Sounder Broadcast

Direct Sounder Broadcast services are derived from the operation of a TIROS Operational Vertical Sounder (TOVS) instrument developed by the United Kingdom and flown on TIROS-N series polar orbiting spacecraft. The prototype instrument, a Vertical Temperature Profile Radiometer, was first flown on NOAA-2 in October 1972. The current instrument provides a multi-channel profile of atmospheric temperature and humidity.

Analysis of the TOVS instrument data requires very sophisticated computer processing. To date, only four countries

have developed facilities to analyze adequately TIROS vertical sounding data, and all are operated by Government meteorological services.

The trend toward establishment of more TIROS sounding readout stations will be very slow, due to the complexity of data reduction and interpretation. It is not an area likely to stimulate commercial interest, except in the development of software and processing facilities.

(4) VISSR -- Visible Infrared Spin-Scan Radiometer

The term VISSR does not identify a direct broadcast service, but rather an instrument carried aboard the GOES satellite series. This instrument, a multi-channel scanning radiometer, provides photographic and computer-generated products, on a scheduled basis, for day/night observations of clouds and cloud heights, snow and ice distribution, surface temperatures, and cloud motion.

The first VISSR instrument was flown aboard NASA's Synchronous Meteorological Satellite (SMS)-1, launched in May 1974. At that time, only NOAA and NASA had VISSR ground receiving equipment. Today, there are 19 VISSR stations in seven countries. Of this number, a TV station in Florida and a commercial/technical firm in Massachusetts each manage and operate a VISSR station. The remainder are government or military stations or quasi-government stations located at academic sites (the universities of Colorado and Wisconsin) in the United States or overseas.

VISSR station costs begin near $250K. While commercial stations could acquire and market VISSR products, it would be more profitable for a commercial firm to provide analyses of weather, hydrologics, or oceanographic features viewed by the VISSR instrument. The market exists, but has been only tapped at the surface. Most new stations probably will be Government or military purchases.

(5) WEFAX (Weather Facsimile) Service

Begun in 1966 as VHF communications relay equipment aboard NASA's Applications Technology Satellite (ATS)-1, WEFAX today

involves S-band broadcasts of processed satellite images, National Weather Service meteorological charts and alpha-numeric products sent at scheduled times via geostationary U.S. satellites. The European Space Agency and the Japanese Meteorological Agency also provide WEFAX services through their own spacecraft. The Soviet Union plans to launch a satellite capable of providing WEFAX services sometime in the near future.

In the Western Hemisphere, WEFAX broadcasts are acquired at approximately 160 locations. Of this number, 57 are operated by foreign government or military organizations, and 23 are U.S. Government or military stations. The remainder are largely academic and amateur stations, except for nine commercial WEFAX receivers; of these, three are operated by TV stations and six by private meteorologists.

In the future, more WEFAX stations should be established. The National Weather Service has substantially increased the number of weather charts sent via WEFAX in an effort to reduce ground communications costs related to the dissemination of these products. As the number of charts is increased, more will be taken off other circuits, and it will be necessary for foreign governments and private commercial users of these charts to obtain WEFAX equipment if they wish to continue chart reception.

Although WEFAX images are only marginally useful for TV presentations, more TV weather program managers may use WEFAX images in the future. Few local TV stations not affiliated with the major networks have access to high quality satellite image products. WEFAX images at least help them present the appearance of utilizing modern technology to their viewers.

A much larger market for WEFAX equipment and products remains untapped, due to a lack of suitable information about the existence of WEFAX services. Any industry that utilizes aircraft for exploration, survey work, or personnel transport, or coastal or sea-going vessels, whether for commercial or recreational purposes, could use WEFAX services and products in conjunction with weather data obtained through more conventional sources to increase profit and safety.

4. Data Collection Services

a. GOES Data Collection System (DCS)

The GOES DCS is a communications relay system that uses the transponder carried on the GOES spacecraft to relay UHF transmissions from data collection platforms (DCPs) by S-band to properly equipped ground stations. Conversely, S-band transmissions from the NOAA ground system can be relayed through the transponder in UHF to properly equipped DCPs. The two operational GOES have radio view coverage of most of the Earth from 0° westward to 170°E longitude. Poleward coverage is limited to about 77° N or S and is restricted to lower latitudes in either direction from the 75° or 135° satellite sub-point longitudes. Each spacecraft is capable of supporting up to 233 channels. The 200 regional or domestic channels use 1.5 kHz channel separation and the 33 international channels use 3.0 kHz channel separation. The 33 international channels are common with both the METEOSAT and GMS spacecraft. Theoretical capacity is in excess of 12,000 DCPs reporting on the average 11 times per day. However, the present ground system is limited to supporting only 80 channels and 5,000 DCPs. A major expansion in the NOAA ground system is required in order to support the capability of the spacecraft.

The present system supports two operational modes (interrogate and self-timed) and an experimental random reporting mode. The interrogate mode requires polling from the NOAA ground system through the satellite before a particular DCP replies. The self-timed mode assigns specific time slots on a channel, and the DCP contains a timing device that regulates its reply transmissions. The random reporting mode requires that the DCP transmits when a preset threshold of a critical measurement parameter is reached. In order to ensure a high probability of a message being received, the random reporting messages are short (2 to 4 seconds) and are repeated in a random manner one or more times. The data rate is 100 bps for all modes of operation. NOAA desires a minimum of 180 DCPs per channel based upon a message repetition rate of once each three hours. There is no processing of data into engineering or physical units in the NOAA ground system and no charges for system users.

(1) Past Users

During the early years of the GOES DCS operation (1975-1979) the majority of users were experimental, i.e., they were testing or experimenting with different data acquisition methods and operational modes for relaying these data. The purpose was to prove to themselves that the system could or could not satisfy their operational requirements. With few exceptions, the early users were U.S. Federal agencies or foreign government agencies.

(2) Present Users

There presently are 69 users that have more than 1,500 active DCPs and more than 3,500 more DCPs to be activated over the next three or four years. The system has expanded at an annual rate of 60 percent since 1979. These users' programs are primarily operational in nature since the original test or experimental program had proven the reliability of the GOES DCS. Less than five percent of the DCPs in the system are operated by other than governmental agencies, either foreign or domestic. The known expansion plans of these users will cause saturation of the present NOAA ground system during the next two to four years. Since the NOAA ground system requires all messages transmitted through the spacecraft to be received for proper monitoring in order to ensure system integrity, the use of direct readout facilities will not alleviate the requirement to expand the ground system at a cost of up to $5M in 1982 dollars.

(3) Potential Users

Limitations on use of assigned frequencies. The frequencies used by the current system are limited to the relay of environmental data only, similar to the ARGOS DCLS. This fact does limit many potential users. In addition, the requirement for any user other than a U.S. Federal agency or a state or local government to have a sponsor from this governmental group to use the system has limited non-governmental organizations' use of the system. However, frequency use restriction is the primary deterrent to use of the system by non-governmental organizations. Under these circumstances it is estimated that user growth will be only from a limited segment of potential users that can operate within these constraints; attaining full use of system capacity will take many years.

The following paragraphs indicate how the system's use might change if operational characteristics or constraints were modified:

No limitations on use of assigned frequencies. Under these circumstances, the system would be used to capacity within a few years. Many industrial users could use the system, in particular the electrical utilities; natural gas, coal, petroleum production pipeline transmission companies; and users who require routine information transmitted from remotely located production facilities. How well such a commercial DCS system would compete with other commercial satellite communication capabilities is not known.

Wide-band, higher data rate channels. Obviously the current 100 bps data rate is not an efficient use of the available bandwidth, especially for those users who must transmit voluminous amounts of data. If a portion of the frequency bandwidth were used to establish wide-band, higher data rate channels, the system would be able to accommodate many more customers. Even if the system is not commercialized, this enhancement should be considered for the follow-on system.

Use of the interrogate link to disseminate information. The present interrogate link is capable of supporting DCP polling, DCP commanding, relay of test mode DCP performance data, and relay of National Bureau of Standards (NBS) time code--which has its own market potential. There are several unused bits in these transmissions that could be used to relay other information such as area weather warnings, instructions for individuals receiving the information, etc. This enhancement could be used by many industries as an effective management tool and would aid in marketing the system.

b. ARGOS Data Collection and Location System

The ARGOS Data Collection and Location System (DCLS) is a

joint Franco-American subsystem of the TIROS-N series of polar orbiting spacecraft. The French build the DCLS instrument that is flown on the U.S. satellites and process all the recorded data for data dissemination and system monitoring. In addition, the DCLS data are relayed in real-time from the VHF beacon and in the TIROS Information Processor data stream via S-band. This allows users with direct readout capability to receive and process the real-time data (only messages from platforms in radio view of the spacecraft while the spacecraft is in view of the direct readout station are received in real-time) in a matter of minutes. Otherwise data processed in France originate from recorded data telemetered to a special ground station and relayed to the French processing center, resulting in an average time delay of more than three hours.

The ARGOS DCLS is the only operational civilian satellite system in the world capable of locating moving platforms. No commercial systems have this capability, and no firm has announced its intention to provide these platform location services. This unique feature uses the doppler shift in frequency of randomly repeated messages from the platform to make the location computations. Accuracies of 500 meters are possible on a routine basis. System capacity varies according to the number of platforms transmitting at one time while in view of the spacecraft, but most estimates indicate that at least 4,000 platforms on a global basis can be accommodated.

(1) Past Users

The ARGOS DCLS became operational during the early part of the First Global GARP (Global Atmospheric Research Program) Experiment (FGGE) in 1979. Early users were primarily participants in FGGE and consisted of government sponsored drifting buoy and constant-level balloon platforms. All FGGE data processing in France was subsidized completely by the French Meteorological Service. At the conclusion of FGGE in December 1979, Service ARGOS (the French Coordination Center) instituted charges for data processing. This has been one of the limiting factors on the growth in the use of the DCLS.

(2) Present Users

The present DCLS user community consists of both operational and research oriented, mostly subsidized programs. Active platforms have varied between 250 and 350 for the past three

years. In 1980, Service ARGOS proposed a substantial discount in processing costs for large users of the system, i.e., users with more than 20 polar platform-years. In order to take advantage of these reduced processing costs, several U.S. government organizations joined together to negotiate a processing agreement with Service ARGOS. In 1982, this processing agreement was expanded to include several other countries' government-sponsored platforms and is referred to as the "ARGOS Joint Tariff Agreement" or the "Global Government Processing Agreement." This agreement includes 88 percent of the 275 active platforms in the system and for the first time addresses the costs of the direct readout users. These users will be charged a much lower fee primarily to be used to defray the system monitoring costs incurred by Service ARGOS. There has been a slight increase in the number of platforms not requiring location but the overwhelming majority (90 percent) require location calculations. Also, the breakdown between operational and research-oriented users has remained relatively constant at: operational 25 percent and research 75 percent. Due to this fact, there are many research-oriented users, but they have relatively small platform networks and few of the research-oriented users have their data disseminated to the operational community.

(3) Potential Users

There are many factors inhibiting the full utilization of the ARGOS DCLS. These are primarily: the time delays inherent with a polar orbiting system (partially overcome by the use of direct readout stations), the competition from the geostationary satellite data collection system (DCS) -- primarily the U.S. GOES DCS which provides 24-hour-per-day coverage and does not charge for using the system, the lack of an aggressive marketing effort by either the French or U.S. operators, the cost of platforms and the means which carry the platform, and the limitations on the use of the presently assigned radio frequencies. To a lesser degree, the short message length (256 bits), the reluctance by the United States to allow non-government sponsored programs to use the system, and the lack of authority for proprietary treatment of data acquired by the system have restricted system use.

Use of the system with present limitations on the use of assigned frequencies. Providing most of the other problems cited above are overcome, many potential users that have been deterred

by one or more of the other problems should become users but, due to the fact the current frequencies are limited to the relay of environmental data only, many potential customers will be barred from using the system. Even under these limitations, the use of the system should increase by 400 or 500 percent.

Use of the system without the present limitations on the use of assigned frequencies. This problem can be overcome, at least in part, by gaining permission from the International Telecommunications Union (ITU) to use the presently assigned frequencies for other than the relay of environmental data and/or adding frequencies that are not restricted to the relay of environmental data. Providing many of the problems outlined above have been corrected, the use of the DCLS should reach its maximum under these circumstances. High seas shipping companies, fishing fleets, and many ground-based transportation firms will take advantage of the system capabilities. With the ability the manager has to obtain both location and other management information through the system, it should prove to be a unique management tool for the transportation and fishing industries. Obviously these capabilities and the DCLS could easily prove to be a self-sustaining or profit-making enterprise under these conditions. Any technological improvements most likely would enhance this capability.

5. Special Services

a. Satellite Field Services Stations (SFSS)

Selected SFSSs (Miami, San Francisco and Washington, D.C.) develop a biweekly regional sea surface temperature product. This product is made available through an automatic dial-in telecopier system over a dedicated phone line. These products were requested by the fishery and other marine interests in the vicinity of the SFSSs. Since the call-ins for this service are not recorded, no prediction of current use or projected use can be made.

b. Movie Loops

NOAA produces daily movie loops from each of the GOES satellites for use by the NWS forecasters and the news media. Presently four networks use these products: CBS, NBC,

Independent Network News (INN), and Independent Television News (ITN). These are provided at no cost to the networks.

c. Local Area Coverage (LAC) Images

The high resolution data which are stored on the polar orbiting satellites are transmitted to the NOAA ground stations and converted to LAC images.

Recording capacity limits operational use to 11.5 minutes of data per orbit, covering roughly 40^0 of latitude. Areas recorded are selected at the request of qualified users. Each recording can produce 1 3/4 images, one full image covering 1600 km by 2400 km.

There presently are three customers outside of NOAA for this information. The three are the Denmark Weather Service, U.S. Navy, and the University of Delaware.

6. Archival Services

The Satellite Data Services Division of NOAA acts as the official archive of all NOAA operational satellite data and information and several non-NOAA satellites (i.e., DMSP, GOES-3, SEASAT, NIMBUS-7). The SDSD archive dates back to April 1960 (TIROS-1) and continues up to the present (GOES-EAST, GOES-WEST, and NOAA-7). Archive products consist of film negatives (25x25 cm, 35mm, 16mm, and 70mm), paper chart products, and digital tapes. This includes over 105,000 digital tapes and 10,000,000 images from 36 satellites carrying 25 different sensors. Annual active accessions of archived products include nearly 250,000 film products and the equivalent of over 8000 CCTs.

The SDSD archives and reproduces all or portions of these data on a retrospective basis for users throughout the world on a cost recovery basis. It has reproduced data for users in all 50

states, the District of Columbia, two U.S. territories, and 90 foreign countries.

Total annual expenses in FY82 for salaries, benefits, contracts, supplies, etc., amounted to $1,200,000. Fifty percent of these expenses ($600,000) were recovered from data sales. Revenue from sales continues to increase and continues to recover increasing percentages of expenses.

Table B-6 illustrates the numbers of orders completed in each full calendar year from 1974 through 1981 for five classes of users. Of primary importance is the nearly 15 percent annual increase in completed orders yearly, and the statistic that 20 percent of these orders were from non-U.S. users.

Table B-7 shows a more detailed breakdown for FY80, 81, and 82. Total sales increased from $340K in FY80 to $596K in FY82 (an increase of 23.4 percent and 41.9 percent respectively). During this three year period an increase in numbers of tape and film orders was experienced with digital tape orders in FY82 accounting for only 23 percent of the orders but 63 percent of the revenue. Film orders, which in FY82 accounted for 51 percent of the total, only resulted in 37 percent of the revenue. Data requests continue to be primarily via letter (47.9 percent) and telephone (40.3 percent).

Table B-8 illustrates the breakdown of Sales vs User Class. The U.S. Government accounted for over 34 percent of the revenue in FY81, and combined with NOAA (14.4 percent) accounted for nearly 50 percent of the revenue. In FY82, U.S. Government orders accounted for 30.3 percent of the revenue and combined with NOAA (21.4 percent) accounted for 51.7 percent of the revenue. Foreign sales increased significantly, but still accounted for only 20 percent of the total revenue. Sales to academia increased slightly. Sales to private industry increased over 75 percent and those to private individuals about 27 percent.

These statistics can be looked at another way by referring to Table B-9. Here we see that although revenue by each class increased between 13 percent and 113 percent and the number of orders for data increased by 23 percent, the total number of orders decreased between 12 percent and 27 percent in all but one category (U.S. Government + 30 percent). This can be explained

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by a combination of these factors:

- o Fewer miscellaneous orders were received.
- o SDSD significantly increased its prices between FY81 and 82.
- o Individual orders accounted for more dollars per order.

Conclusion: In FY82 U.S. Government and NOAA combined accounted for nearly 40 percent of the orders and over 50 percent of the revenue.

Table B-10 illustrates the breakdown of User Class by Type of Data Product purchased (i.e., tape or film). In FY81, in every class film orders accounted for 48 percent to 99 percent of the orders. In total, in FY81 film orders accounted for 84.8 percent of the total. In FY82, film orders still outranked tape orders in every class except U.S. Government. In total, in FY82 film orders declined to 34.8 percent of the total.

Conclusion: Requests for film products have declined recently from 84.8 percent to 74.8 percent, while tape requests increased from 15.2 percent to 25.2 percent.

Table B-11 breaks down the orders of major oceanographic data users (revenue) by satellite type and product type. Although sales in all categories increased significantly, we see the following trends:

- o The percent of revenue recovered by each satellite type remained fairly constant.
- o Sales of GOES tapes declined, but imagery sales increased.
- o Sales of NOAA Polar-Orbiter data remained over 50 percent of the total revenue.
- o Total percent sales of GOES and non-NOAA data remained fairly constant.
- o Sales of digital data increased over $100K, but declined slightly percentage-wise.

SUMMARY

Between FY81 and FY82:

- o Total orders declined (mostly miscellaneous).
- o Total tape orders increased (776 to 1137).
- o Total film orders increased (1996 to 2281).
- o Total tapes produced decreased (3649 to 3338).
- o Total film produced increased (25,989 to 27,376).
- o Tape revenue increased ($276,668 to $376,112).
- o Film revenue increased ($143,307 to $219,982).
- o Total revenue increased ($419,975 to $596,094).
- o Tapes account for 23 percent of orders and 63 percent of revenue.
- o Film accounts for 51 percent of orders and 37 percent of revenue.
- o Miscellaneous orders account for 26 percent of orders.
- o U.S. Government and NOAA are largest users (order and dollar-wise).
- o Foreign users accounted for 19 percent of order and 19 percent of dollars.
- o Academia orders declined somewhat, revenue increased.
- o Private industry orders declined somewhat, revenue increased.
- o Private individuals remained fairly constant.
- o Relative percent spread by satellite-type remained constant.

The application of marketing techniques could increase data sales. The private sector is in a better position to expand the markets than the Government.

TABLE B-6
User Class vs Sales ($$)

User Class	FY81 $$	FY81 (% of Total)	FY82 $$	FY82 (% of Total)	% Increase in $$
1. U.S. GOVERNMENT	$146,362	(34.8%)	$180,603	(30.3%)	+ 23.4%
2. NOAA	59,956	(14.4%)	127,667	(21.4%)	+112.9%
3. FOREIGN	87,203	(20.8%)	113,994	(19.1%)	+ 30.7%
4. ACADEMIA	74,900	(17.8%)	84,864	(14.2%)	+ 13.3%
5. PRIVATE INDUSTRY	48,022	(11.4%)	84,473	(14.2%)	+ 75.9%
6. PRIVATE INDIVIDUAL	3,532	(0.8%)	4,493	(0.8%)	+ 27.2%
TOTALS	$419,975	(100.0%)	$596,094	(100.0%)	+ 41.9%

TABLE B-7
Comparison of Classes by
% of Orders and % Sales

User Class	FY81 % Orders	FY81 % Sales	FY82 % Orders	FY82 % Sales	% Increase Orders	% Increase Sales
1. U.S. GOVERNMENT	15.2%	34.8%	22.2%	30.3%	+30.4%	+ 23.4%
2. NOAA	17.6%	14.4%	17.0%	21.4%	-14.5%	+112.9%
3. FOREIGN	21.6%	20.8%	19.1%	19.1%	-21.5%	+ 30.7%
4. ACADEMIA	19.3%	17.8%	16.0%	14.2%	-27.6%	+ 13.3%
5. PRIVATE INDUSTRY	18.2%	11.4%	17.7%	14.2%	-14.6%	+ 75.9%
6. PRIVATE INDIVIDUAL	8.1%	0.8%	8.0%	0.8%	-12.0%	+ 27.2%

Table B-8

User Class vs Type of Data Product

FY81

USER CLASS	TOTAL ORDERS	# OF TAPE ORDERS	% OF TOTAL	# OF IMAGERY & OTHER ORDERS	% OF TOTAL
1. U.S. GOVERNMENT	773	335	(43.3%)	438	(56.7%)
2. NOAA	896	139	(15.5%)	757	(84.5%)
3. FOREIGN	1099	91	(8.3%)	1008	(91.7%)
4. ACADEMIA	982	150	(15.3%)	832	(84.7%)
5. PRIVATE INDUSTRY	926	59	(6.4%)	867	(93.6%)
6. PRIVATE INDIVIDUAL	416	2	(0.5%)	414	(99.5%)
	5092	776	(15.2%)	4316	(84.8%)

FY82

USER CLASS	TOTAL ORDERS	# OF TAPE ORDERS	% OF TOTAL	# OF IMAGERY & OTHER ORDERS	% OF TOTAL
1. U.S. GOVERNMENT	1008	569	(50.0%)	439	(43.6%)
2. NOAA	766	231	(20.3%)	535	(69.8%)
3. FOREIGN	863	111	(9.8%)	752	(87.1%)
4. ACADEMIA	711	146	(12.8%)	565	(79.5%)
5. PRIVATE INDUSTRY	791	80	(7.1%)	711	(89.9%)
6. PRIVATE INDIVIDUAL	366	0	(0.0%)	366	(100.0%)
	4505	1137	(25.2%)	3368	(74.8%)

Table B-9
Satellite Series and Type of Data Product vs Sales

	FY81		FY82	
	$$	$ OF TOTAL	$$	$ OF TOTAL
GEOSTATIONARY SATELLITES				
Digital Tapes	$ 50,286	41.7%	$ 47,355	28.9%
Film Products	70,351	58.3%	116,547	71.1%
Other	2	0.0%	0	0.0%
Subtotal	$120,639	(28.7%)	$163,902	(27.3%)
NOAA POLAR ORBITERS				
Digital Tapes	$168,093	75.9%	$260,836	79.9%
Film Products	48,811	22.0%	60,236	18.4%
Other	4,466	2.1%	5,359	1.7%
Subtotal	$221,370	(52.7%)	$326,631	(54.8%)
NON-NOAA SATELLITES				
Digital Tapes	$ 58,289	74.8%	$ 67,901	64.3%
Film Products	19,677	25.2%	37,640	35.7%
Other	0	0.0%	0	0.0%
Subtotal	$ 77,966	(18.6%)	$105,541	(17.7%)
SUMMARY				
Total Digital Tapes	$276,668	(65.9%)	$376,112	(63.1%)
Total Film Products	138,839	(33.1%)	214,423	(36.0%)
Total Other	4,468	(1.0%)	5,559	(0.9%)
GRAND TOTAL	$419,975	(100.0%)	$596,094	(100.0%)

Table B-10
Data Orders vs User Class and Data Class
(FY80, 81, 82)

	USERS			ORDERS			RECEIPTS		
ALL DATA	FY80	FY81	FY82	FY80	FY81	FY82	FY80	FY81	FY82
1. U.S. GOVERNMENT	102	101	120	405	634	784	$ 90,660	$146,362	$180,603
2. NOAA	111	100	90	556	804	571	84,873	59,956	127,667
3. FOREIGN	134	155	150	489	620	512	49,621	87,203	113,994
4. ACADEMIA	150	160	174	660	739	525	71,996	74,900	84,864
5. PRIVATE INDUSTRY	228	286	304	465	647	667	39,906	48,022	84,473
6. PRIVATE INDIVIDUAL	161	157	163	199	182	185	3,327	3,932	4,493
GOES									
1. U.S. GOVERNMENT	48	48	47	187	170	128	$ 33,664	$ 30,894	$ 27,964
2. NOAA	61	50	41	304	437	321	26,913	17,696	19,242
3. FOREIGN	35	32	31	97	130	134	13,316	13,119	28,638
4. ACADEMIA	48	51	67	192	179	175	21,000	20,554	39,395
5. PRIVATE INDUSTRY	119	130	149	202	316	372	16,369	21,883	46,908
6. PRIVATE INDIVIDUAL	88	77	42	112	90	54	2,046	1,514	1,938
TIROS SERIES									
1. U. S. GOVERNMENT	47	52	57	171	401	594	$ 33,029	$ 93,930	$127,631
2. NOAA	39	51	44	195	318	299	27,678	35,039	84,573
3. FOREIGN	61	95	86	321	401	291	20,189	26,240	40,277
4. ACADEMIA	80	75	67	390	457	245	40,474	37,705	33,125
5. PRIVATE INDUSTRY	70	100	89	156	200	157	6,985	9,098	17,699
6. PRIVATE INDIVIDUAL	60	73	103	66	77	109	712	1,138	1,765
OTHER DATA (SATELLITES)									
1. U. S. GOVERNMENT	26	32	31	47	76	62	$ 21,967	$ 25,674	$ 23,635
2. NOAA	24	26	33	57	87	106	30,282	6,580	24,238
3. FOREIGN	50	60	54	71	113	93	18,116	44,833	45,549
4. ACADEMIA	50	65	64	78	123	106	10,522	13,709	12,675
5. PRIVATE INDUSTRY	69	93	95	107	175	148	16,552	18,750	20,120
6. PRIVATE INDIVIDUAL	19	15	22	21	22	22	569	1,629	727

Table B-11
Summary of Major SDSD Oceanographic Data
Users for Fiscal Year 1982

AFFLIATION/ MAJOR CONTRACT	DIGITAL DATA						PHOTOGRAPHIC DATA					ANALYSIS CHARTS					MAJOR APPLICATIONS	FY82 PURCHASES	
	NOAA				NON-NOAA		NOAA			NON-NOAA									
	LAC HRPT	GAC	SST	SNOW ICE	SEA-SAT	CZCS	LAC HRPT	GAC	SST	SEA-SAT	CZCS	GOES COMP	GULF ST_a	NH SNOW	JOINT ICE	GRT LKS			
Naval Ocean Research & Development Agency	X				X	X	X			X	X	X	X				IR Studies of Gulf of Mexico "Installing own receiving station this FY (Daily subscriber)	$7,684 671 162 $8,517	Tapes Photos Charts Total
NOAA/NMFS/NE Fish Center	X					X	X				X	X	X				IR Studies of Gulf Stream for Fisheries (Daily subscriber)	$5,436 7,393 50 $12,879	Tapes Photos Charts Total
University of Rhode Island	X	X				X	X	X				X					IR Studies of Gulf Stream (Daily subscriber)	$7,026 534 38 $7,598	Tapes Photos Charts Total
University of Miami	X							X				X					IR Studies of Gulf Stream, Kuroshio Current, Somlia Current (Upon Request)	$6,425 2,307 38 $8,770	Tapes Photos Charts Total
Louisiana State University	X					X	X	X			X						Current Studies, Gulf of Mexico, Korea, Yellow Sea (Upon Request)	$1,362 1,530 — $2,892	Tapes Photos Chart Total
British Antarctic Survey							X										Ice Studies in Antarctica (visible (Daily subscriber)	— $ 955 — $ 955	Tapes Photos Chart Total
Remote Sensing Tech. Ctr of Japan	X				X	X	X			X	X						General Oceanographic Studies (Upon Request)	$ 684 1,848 — $2,532	Tapes Photos Charts Total
Deutsches Hydro. Institute							X										Ice Studies in Antarctica Visible (Daily subscriber)	— $ 720 — $ 720	Tapes Photos Charts Total

Table B-11
Summary of Major SDSD Oceanographic Data
Users for Fiscal Year 1982 (cont'd)

AFFILIATION/ MAJOR CONTRACT	DIGITAL DATA NOAA LAC HRPT	GAC	SST	SNOW ICE	NON NOAA SEA-SAT	C2CS	PHOTOGRAPHIC DATA NOAA LAC HRPT	GAC	SST	NON-NOAA SEA-SAT	C2CS	ANALYSIS CHARTS GOES CONF	GULF ST.	NH SNOW	JOINT ICE	GRT LKS	MAJOR APPLICATIONS	FY82 PURCHASES
Atmospheric Environmental Service Canada	X				X		X					X					General Oceanographic Studies, Primarily using SEASAT (Upon Request)	$30,066 Tapes 1,396 Photos 32 Charts $31,494 Total
Esso Resources Canada							X										Ice Studies in Arctic (Daily subscriber)	$ -- Tapes 4,251 Photos -- Charts $4,251 Total
User Systems, Inc.					X					X							General Ocean Studies SEASAT (Upon Request)	$ 144 Tapes 1,658 Photos -- Charts $1,802 Total
University of Delaware	X					X	X				X	X					General Ocean Studies (Upon Request)	$ 256 Tapes 295 Photos 38 Charts $ 589 Total
CSIRO (Australia)	X					X	X				X						General Ocean Studies (Upon Request)	$ 840 Tapes 612 Photos -- Charts $1,452 Total
CSIR (Africa)							X										General Ocean Studies (Upon Request)	$ -- Tapes 1,471 Photos -- Charts $1,471 Total
Embassy of Australia							X					X					General Ocean Studies (Daily subscriber)	$1,669 Tapes 21 Photos -- Charts $1,690 Total
Inst. de Pesquisa Espacias (Brazil)																	GOES Imagery Only (Daily subscriber)	$ -- Tapes 4,396 Photos -- Charts $4,396 Total

Table B-11
Summary of Major SDSD Oceanographic Data
Users for Fiscal Year 1982 (cont'd)

AFFILIATION/ MAJOR CONTRACT	DIGITAL DATA NOAA LAC HRPT	NOAA GAC	NOAA SST	NOAA SNOW ICE	NON-NOAA SEASAT	NON-NOAA CZCS	PHOTOGRAPHIC DATA NOAA LAC HRPT	NOAA GAC	NOAA SST	NON-NOAA SEASAT	NON-NOAA CZCS	ANALYSIS CHARTS GOES CONF	GULF ST.	NH SNOW	JOINT ICE	GRT LKS	MAJOR APPLICATIONS	FY82 PURCHASES
Woods Hole Ocean Instrument	X						X					X					General Ocean Studies (Upon Request)	$ 204 Tapes 232 Photos 2 Charts $ 438 Total
Scripps Inst. Ocean, University of California	X					X	X				X	X					General Ocean Studies (Upon Request)	$ 794 Tapes 1,133 Photos 8 Charts $1,935 Total
U.S. Army Corps of Engineers							X			X			X				Gulf Stream Studies (primarily SEASAT) (Upon Request)	$ -- Tapes 1,716 Photos 25 Charts $1,741 Total
Jet Propulsion Lab	X					X	X				X	X					General Ocean Studies, Some GOES Imagery (Upon Request)	$1,624 Tapes 1,806 Photos 5 Charts $3,437 Total
NORTECH, Inc							X										Ice Studies (Upon Request)	$ -- Tapes 6,207 Photos -- Charts $6,207 Total
Lockheed Missile	X																General Ocean Studies (Upon Request)	$2,350 Tapes -- Photos -- Charts $2,350 Total
Environmental Research Inst. Michigan, ERIM	X				X		X			X							General Ocean Studies in Support of SEASAT (Upon Request)	$ 548 Tapes 624 Photos -- Charts $1,172 Total
NOAA/NESDIS	X																General Ocean Studies (Upon Request)	$9,740 Tapes -- Photos -- Charts $9,740 Total

Table B-11
Summary of Major SDSD Oceanographic Data
Users for Fiscal Year 1982 (cont'd)

AFFLIATION/ MAJOR CONTRACT	DIGITAL DATA NOAA LAC HRPT	GAC	SST	SNOW ICE	NON NOAA SEA-SAT	CZCS	PHOTOGRAPHIC DATA NOAA LAC HRPT	GAC	SST	NON-NOAA SEA-SAT	CZCS	ANALYSIS CHARTS GOSS COMB	GULF ST.	NH SNOW	JOINT ICE	GRT LKS	MAJOR APPLICATIONS	FY82 PURCHASES
Miscellaneous Ocean Charts												X	X	X	X	X	Total of 207 subscribers	$ -- Tapes -- Photos 8,112 Charts $8,112 Total
												176	185	132	101	114		
TOTALS: 25 USERS	15	1	0	0	5	9	20	2	0	5	8	85	89	32	0	14		$75,182 Tapes 43,406 Photos 8,528 Charts 127,116 Total

B. Landsat Data

1. Introduction

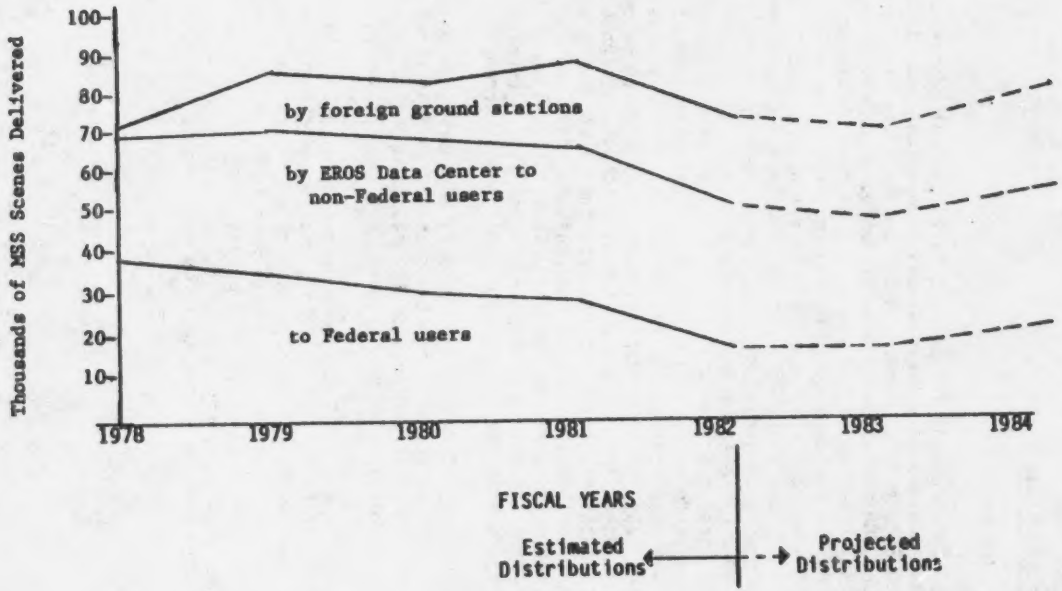
The global demand for Landsat Multispectral Scanner (MSS) data has remained relatively stable from fiscal year 1978, as shown on Figure B-1. Average distributions have remained around 80,000 scenes per year. Estimated annual distributions have been as low as 73,000 scenes and as high as almost 89,000. Use by U.S. Government agencies has declined from a high of 40,000 scenes in fiscal year 1978 to a low of around 17,000 scenes in fiscal year 1982. Offsetting this decline, non-Federal data purchases from the EROS Data Center have increased from around 30,000 scenes to approximately 34,000, and distributions from the foreign ground stations have risen from a low of around 3,000 scenes to an estimated high in fiscal year 1982 of around 22,000 scenes. Projections for fiscal years 1983 and 1984, as developed later in this chapter, show an average annual global distribution of around 78,000 scenes, although it cannot be determined at this time just how much the value demand in these two years will decline due to the drastic (about two and one-half times) increases in unit prices for data which became effective in the United States in October 1982. Foreign ground stations are expected to increase their prices proportionately.

Projections of demand for MSS data beyond fiscal year 1984 are that this demand will remain constant, perhaps growing by a few percent per year, unless additional major price increases are imposed, in which case demand could drop significantly.

Modest demand for Thematic Mapper (TM) data will be evident in fiscal years 1983 and 1984, not because of disinterest on the part of the users, but because so little TM data will be available for purchase. In fiscal year 1985 and subsequent years, the user's reaction to the high price of TM data cannot be predicted with certainty, but it is estimated that as many as 30,000 copies of TM scenes could be sold around the world each year.

FIGURE B-1

GLOBAL DISTRIBUTION OF MSS DATA
ESTIMATED AND PROJECTED
FISCAL YEARS 1978 THROUGH 1984



The private sector's abilities to market the data aggressively are expected to increase substantially the future demand for MSS and TM data.

2. Multispectral Scanner (MSS) Data

Landsat Multispectral Scanner (MSS) data have been available since the early 1970s. The early years of this period are characterized as a time of exploratory research to develop techniques of extracting useful information from satellite data in imagery and digital forms.

The close of the 1970s and the early 1980s continued this exploratory research but also began major efforts on the part of the users to test the technology for internal use -- to develop methods, techniques, and internal capabilities to use MSS data routinely in research and operational programs.

The period fiscal years 1978 through 1982 was selected for initial analysis in this report because it sets the scene for estimates of present Federal and non-Federal requirements and provides a stepping stone for examining projected needs. Present MSS requirements are analyzed based on projected deliveries for FY 1983 and 1984. Projected MSS requirements are for FY 1985 and beyond.

The worldwide system for distributing MSS data today consists of major outlets in the European Space Agency (ESA) and nine countries: Argentina, Australia, Brazil, Canada, India, Japan, South Africa, Thailand, and the United States. Each foreign operator has at least one ground receiving station, with ESA and Canada having two. Canada is in the process of combining its stations on the east and west coasts into a single mid-continent station. New stations are being established in China and Indonesia.

In 1982, these major outlets sold (or in the case of some non-U.S. outlets distributed without charge) approximately 68,800 scenes of Landsat MSS data, as shown on Table B-12. Nearly 70 percent of this data was sold by the EROS Data Center in Sioux Falls, South Dakota. Canada distributed the next largest amount (almost 10 percent). Approximately 13 percent of the scenes distributed worldwide were in digital form.

Table B-12:

Landsat Worldwide MSS Data
Sales Summary - CY 1981 1/ 2/

Country Selling MSS Data	Scenes in Imagery Form	Scenes in Digital Form	Total
Argentina	490	40	530
Australia	1,910	500	2,410
Brazil	2,770	190	2,960
Canada3/	5,880	690	6,570
ESA3/	830	1,090	1,920
India	770	10	780
Japan	2,470	1,080	3,550
South Africa	1,030	100	1,130
Thailand	1,990	50	2,040
Subtotal FGS	18,140	3,750	21,890
USA (EDC)	41,850	5,060	46,910
Grand Total	59,990	8,810	68,800

1/ Roughly equivalent to U.S. FY 1981
2/ Includes MSS Data sold or distributed without costs by the FGS
3/ Two receiving stations

Over the last three calendar years in which there has been significant activity in the foreign ground stations, worldwide demand for MSS data (as measured by records from the ten countries) has declined around 6 percent. Distributions between 1978 and 1981 by four operators (Canada, ESA, Japan, and Thailand) have increased between 25 and 68 percent with a net increase of 46 percent, while Brazil's distribution has declined 56 percent in this same period. Three nations (Australia, India, and South Africa) brought their systems into operation in 1980. Their combined two-year growth rate was over 650 percent, a figure not significant because initial distribution was quite limited. Net distributions by all non-U.S. nations declined two percent

between 1979 and 1980 (Brazil accounted for this decline); increased by 37 percent between 1980 and 1981; with a net 34 percent increase between 1979 and 1981. Sales by the EDC show a 9 percent decline in this same period, although as discussed later, these EDC statistics do not include substantial amounts of MSS data delivered to Federal users by NASA.

The distribution/sales figures used in this report refer to the number of scenes delivered to users rather than revenues, because for several nations distributions include scenes sold and scenes distributed without charge. Each nation has a price list, and the unit charges for delivered products is neither consistent among the nations nor constant over time. Also, the international rates of exchange vary with time. For reference, Table B-13 shows the unit charges as of October 1982 by all ten operators for certain common MSS data products.

Analysis of worldwide MSS sales records for 1979, 1980, and 1981 (converting foreign distributions to sales in equivalent U.S. dollars at the unit prices and rates of exchange prevalent in each year) shows that worldwide "sales" revenues totaled $3,037 million in 1979, $3,801 million in 1980, and $4,851 million in 1981, for a net 60 percent increase in annual revenue despite the 6 percent reduction in volume demand.

a. Federal Use of MSS Data

(1) Historical Use (Fiscal Years 1978 - 1982)

In FY 1978 through 1982 there was a major interest in MSS data on the part of Federal users although as shown in Figure B-2 deliveries to Federal users declined substantially in fiscal years 1981 and 1982. In large part this decline is related to the completion or phase-down of major user agency research and development programs. These applications which move into operational use generally require less data than is required early in the R&D phase. Almost 154,000 MSS scenes were delivered to Federal users by the NASA Goddard Space Flight Center (GSFC) and the Department of the Interior's EROS Data Center (EDC). Imagery deliveries totaled around 100,000 of these scenes during this period. In FY 1978, 24 percent of the data delivered to Federal users was in digital form. This percentage grew to 34 percent in FY 1982, demonstrating the growing interest in and the capability to use MSS data in its digital form.

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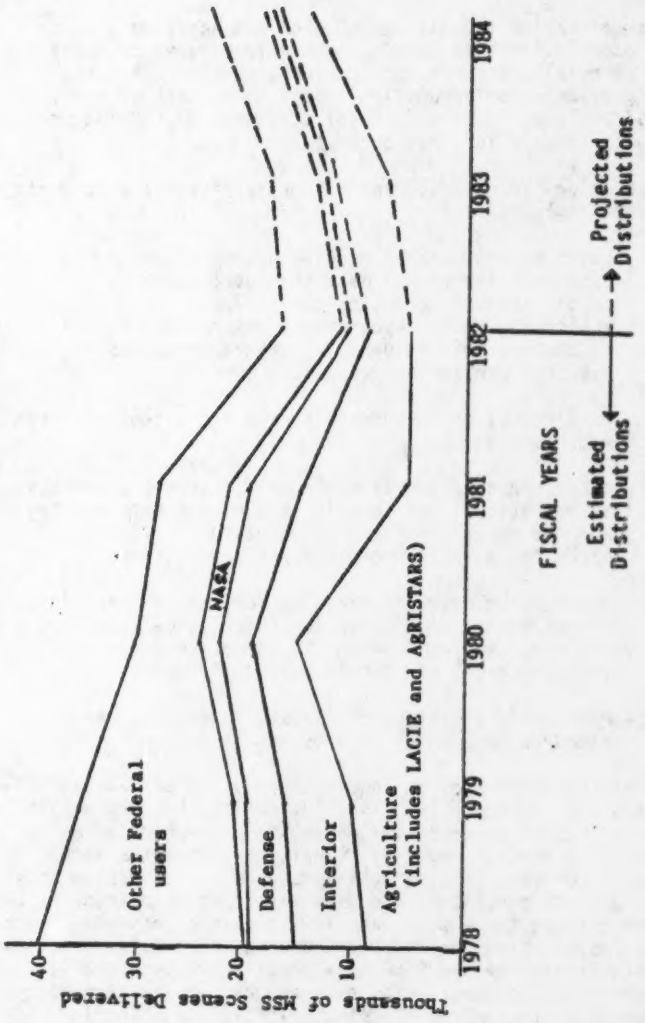
Table B-13
International Landsat MSS Data Prices
(In U.S. Dollars)
October 1982

Product	Argentina	Australia	Brazil	Canada	ESA	India	Japan	So. Africa	Thailand	USA
1:1,000,000 Scale, B/W Film	29.00	13.00	65.00	11.00	38.00	12.00	18.00	12.00	10.00	30.00 (Pos.)
1:1,000,000 Scale, B/W Paper	18.00	12.00	41.00	9.00	32.00	12.00	17.00	12.00	2.50	30.00
1:1,000,000 Scale, Color Film	37.00	33.00	83.00	18.00	96.00	20.00	51.00	18.00	40.00	74.00
1:1,000,000 Scale, Color Paper	29.00	20.00	65.00	17.00	85.00	15.00	46.00	18.00	10.00	45.00
1:500,000 Scale, B/W Paper	34.00	23.50	85.00	21.00	51.00	20.00	N.A.	14.00	7.50	58.00
1:500,000 Scale, Color Paper	58.00	42.00	130.00	40.00	128.00	65.00	N.A.	36.00	22.50	90.00
1:250,000 Scale, B/W Paper	38.00	42.00	172.00	37.00	77.00	35.00	N.A.	24.00	15.00	95.00
1:250,000 Scale, Color Paper	66.00	94.00	N.A.	75.00	192.00	150.00	N.A.	90.00	75.00	175.00
Computer Compatible Tapes-MSS	300.00	310.00	560.00	190.00	426.00	225.00	292.00	120.00	N.A.	650.00

NOTES:
Australia: Based on full scene, priority 3. ($1 Australian=$.9392 U.S.)
Brazil: CCT's based on bulk prices.
Canada: Add handling charges to prices - $5 per order. ($1 Canadian=$0.82 U.S.)
ESA (Earthnet): Price conversion is 1AU-1.0659 U.S. dollars; color prices based on prints from Earthnet catalogue.
India: Add packing, forwarding, and shipping charges to prices - 10% of order.
Japan: Price conversion is 232.7 yen = 1.00 U.S. dollar. Prices include shipping charges - charge varies with product.
South Africa: R1=$1.2 U.S.
Thailand: Reversal products.
USA: Prices effective October 1, 1982.

FIGURE B-2

DELIVERIES OF LANDSAT MSS DATA TO
FEDERAL USERS BY NASA-GSFC & DOI-EDC



Data deliveries in this period also demonstrated a major Federal user interest in developing the techniques to apply MSS data to renewable resource applications, particularly in assessing global crop production. Some 56 percent of the data delivered to Federal users (a total of almost 87,000 MSS scenes) were used primarily for this purpose.

Other major Federal experimental or operational uses during this period included:

DOD - tests by the Defense Mapping Agency of the applicability of MSS data in global mapping, particularly in charting shallow-water features, and monitoring water impoundments behind dams by the Corps of Engineers in response to the requirements of the National Dam Inspection Act.

EPA - experiments to detect the source and extent of fresh water pollution.

DOI - experiments or operational use to support a variety of operational missions in land management, mapping, and the development and integration of digital data bases for a variety of resource applications.

DOC - experimental uses in planning for census operations, assessment of snow cover for hydrological applications, and experimental programs to correlate ocean color with the catch of certain marine fisheries.

DOA - MSS use in a variety of forest, range, and other resource management efforts was tested.

The historical trends in Federal agency use of Landsat MSS data (as shown in Figure B-2) is illuminating, but the ability to project present or potential demand from these data is complicated by several factors. First, user agencies were required to pay very little for the data delivered during this period. Only 39 percent of the data were purchased from the EDS, and rates charged there were very low, covering only the direct costs of reproduction and order processing. The balance of the data was delivered by the GSFC at virtually no cost at all. NASA provided 61 percent of the data as part of its technology development and technology transfer efforts. Starting in

FY 1983 all user agencies will be billed for all data deliveries at unit prices that are some three times higher than EDC has been charging. This may result in a small reduction in volume demand.

Second, for some mapping and charting programs, a large global set of data was collected during this period. Because the mapped and charted features change very slowly over time, these MSS data sets will not have to be replicated for many years, if ever.

Finally, some of the demonstrations undertaken during this period may have been technologically successful in a "laboratory" environment, but they may not be implemented operationally by the user agencies. There are a variety of technical, policy, or cost reasons for these decisions, including the availability of other less expensive alternatives to achieve an acceptable level of information flow, or the availability of usable information from other data sources (classified or unclassified).

(2) Present Use (Fiscal Years 1983 - 1984)

Federal programs which use MSS data collected over domestic areas of the United States are expected to continue at a relatively constant level of demand. Annual deliveries to user agencies will be around 6,000 scenes (around 17 percent in digital form). These deliveries will support a variety of resource assessment and management programs. The Department of the Interior will purchase around 40 percent of this total, with the Department of Agriculture purchasing around 15 percent of the total. The balance of the demand will come from the Corps of Engineers and other Federal agencies with smaller data requirements.

Annual requirements for MSS data over foreign areas will continue to dominate the Federal purchasing patterns, with the agencies purchasing around 14,000 and 19,000 scenes in fiscal years 1983 and 1984. Approximately 70 percent of the data delivered in fiscal year 1983 will be in digital form, and this figure will grow to over 80 percent in fiscal year 1984. This reflects a continuing interest in some user agencies (principally the Department of Agriculture) to process MSS data in its digital form. Digital data processing improves the information extracted from the satellite data and reduces the number of people who must be assigned to data analysis in programs such as global crop condition assessment and global crop production forecasting.

The Department of Agriculture will require about 60 percent of these foreign data. The Department of the Interior is expected to need around 4 percent for use in non-renewable resource assessments conducted for sponsoring agencies or nations. The balance of the foreign MSS data requirements supports various mapping, charting and engineering missions.

The number of scenes in digital and imagery form used in global crop estimating in these two fiscal years is down somewhat from the levels delivered in the 1978-82 development period. During developmental efforts such as the Large Area Crop Inventory Experiment and AgRISTARS (Agriculture and Resources Inventory Surveys Through Aerospace Remote Sensing), an average of around 23,000 scenes per year were used for crop assessments. Current annual requirements are around 12,000. In part, this difference is due to the fact that during the development effort, a large number of historical scenes were used for analyses. Furthermore, research has shown that some crop areas need not be observed as frequently during the growing season as was done in the technique testing phases. During parts of the development period both Landsat 2 and 3 were functioning, and more frequent coverage was available. Also, user agencies, now faced with the need to purchase operational data from their own (augmented) budgets, will be more selective in stating their requirements than was required in the research and development phase. Finally, since Landsat 4 (formerly called Landsat D) does not have on-board recorders to record MSS data, the Tracking and Data Relay Satellite System (TDRSS) must be used to relay data collected over foreign areas to the United States for processing. The launch of the first TDRSS satellite in April 1983 will provide some data relay capability, and the launch of the second later in 1983 will complete global capability for all areas

except a portion of the Earth in the eastern U.S.S.R. Until these satellites are declared operational, foreign data acquisitions are limited to those areas serviced by foreign ground stations equipped with special U.S.-supplied tape recorders. This limited ability to collect foreign data naturally limits the demand for delivered data products.

(3) Projected Use (1985 and beyond)

There is no reason to project that the Federal user requirements for MSS data collected over domestic areas will change significantly in the future.

Continued levels of MSS data requirements over foreign areas are less certain. It is recognized that MSS data is a very useful tool which, because of the identified multispectral signatures of crops and other vegetative covers of interest, provides crop identification and indications of crop stress or health that are not available in the same detail from any satellite sensor systems other than Landsat's MSS or Thematic Mapper (TM). However, routinely extracting this information is costly, perhaps more costly than user agencies can afford. The costs of data are now relatively high and could go higher if system operations cost recovery goals are not met, and the cost of information extraction can be very substantial when many thousand MSS scenes must be analyzed. The Department of Agriculture continues to explore the contributions of other satellite data (for example the Advanced Very High Resolution Radiometer (AVHRR) data from NOAA's polar orbiting meteorological satellites) and other data sources to evaluate their contribution to improved information on global crop production estimates. Fundamentally, the as yet unanswered questions are:

- What are the incremental improvements in crop forecasts made using MSS data analysis over estimates made using non-satellite data sources?
- What is the difference in this incremental improvement if other satellite data (e.g., AVHRR data) are substituted in part for MSS data?
- What is the economic value of either of these incremental improvements in information extraction and analyses technology?

The answers to these sorts of questions, not only in the USDA's global crop assessment program but other Federal agency programs as well, will ultimately determine the aggregated Federal needs for MSS data. These uncertainties and concerns are less likely to materially impact purchases of MSS data over domestic areas. Domestic data volumes needed by each user are relatively low, thus the cost is modest in proportion to other program costs, and MSS analysis is a very cost-effective tool. The demand by Federal users for domestic data will thus likely remain relatively constant in FY 1985 and the following years of the lifetime of Landsat D'.

(4) Summary of Federal Requirements for MSS Data

Figure B-2 summarizes the aggregation of Federal needs for MSS data. The plots for fiscal years 1978 through 1982 reflect actual data distributions to the Federal users. Plots for fiscal years 1983 and 1984 reflect the agency estimates provided to NOAA in December 1982, and the plots for 1985 and beyond reflect a range of probable agency requirements based on their estimates and the discussions above. Details of the FY 1983 and FY 1984 requirements are also tabulated in Table B-14.

Contrary to the commonly held belief, Federal users do not represent one half of the demand for MSS data. Federal demand in fiscal year 1978 represented 58 percent of the data distributed by NASA and the EDC, and 55 percent of the data distributed globally. These percentages have declined steadily until they were 33 percent of U.S. distributions, and 23 percent of global distributions in fiscal year 1982. These percentages will average 39 and 27 respectively for fiscal years 1983/84.

It cannot be determined at this time whether the projected Federal requirements for MSS data in the outyears will change when the Landsat system is commercialized. A commercial venture which provides an acceptable assurance of data continuity at prices the user programs can afford (assuming data technical specifications and data delivery provisions that are acceptable to the user programs) would trigger a higher demand than would a venture that does not meet these conditions. Once a specific commercial venture is identified, Federal user agencies can again be questioned on their requirements.

Table B-14

Present Federal Agency Requirements
For MSS Data - FY 1983 and 1984 1/

	Scenes Required2/ FY 1983	FY1984
Department of Agriculture	9,915	14,935
Department of Interior	2,770	2,840
Department of Defense3/	690	790
National Aeronautics and Space Administration	840	625
Other Federal Agencies	4,650	5,000
Total	18,865	24,190

1/ Volume requirements are dependent on adjustments to the budgets of certain agencies, as directed by the Office of Management and Budget. The requested fiscal year 1983 adjustment for the Department of Agriculture was not fully supported in the Department's appropriations. Agriculture's demand in fiscal year 1983 could, therefore, be reduced by as much as 50 percent. Fiscal year 1984 volume requirements are dependent on annualizing the fiscal year 1983 budget adjustments, and the figures used in this table are also uncertain.

2/ Includes MSS scenes delivered in either digital or imagery form.

3/ Includes the Defense Mapping Agency and the Corps of Engineers.

b. Non-Federal Users of MSS Data

The records of the EROS Data Center group non-Federal purchasers of MSS data into the following five major categories:

- o Foreign -- This category includes all customers who order data and specify a delivery address outside the United States. Thus, U.S. firms with foreign operations and all foreign customers (government and non-government) are in this category;

- o Industrial -- Includes all customers who list their affiliation as a U.S. based firm and who specify delivery in the United States;

- o Academic -- Includes orders placed which identify an academic institution in the United States;

- o State and Local Governments -- Includes all non-Federal governmental customers; and

- o Individuals -- This category includes individual purchasers (people who order imagery for decorative purposes, for example), and customers who do not specify an organizational affiliation (such as one of the above categories) and who specify delivery within the United States.

These categories will be used in this report because of the wealth of data available on their past purchasing patterns, and because they provide a convenient grouping when analyzing probable future purchasing patterns. Data on the characterization of MSS data purchasers who deal with major distribution points in other nations are not readily available but, with some exceptions discussed later in this section, it is believed that their purchasing patterns will complement their U.S. counterparts.

Users in the Foreign category have been major EDC customers. They have made about half of the non-Federal purchases of MSS data over the years, and they have represented about one third of the total Federal and non-Federal volume data purchases. It should be noted that these figures do not include foreign purchases from non-U.S. distribution outlets. In many cases, foreign buyers came to EDC because: prices were lower than at the foreign sources; EDC's services were more prompt and reliable; the EDC's data global holdings were more complete; the data were not available in processed form from foreign sources due to the backlog of unprocessed data; or for a variety of business (confidentiality) or political reasons.

This Foreign category is an amalgam of different user groups which are believed to be comparable to their United States

counterparts (e.g., U.S. Federal, different industrial sectors, etc.). It is believed that these counterpart user groups will have common responses to those conditions of a commercial land remote sensing system and its data marketing. Thus, for analytical purposes in this report when technology development, price sensitivity, assurance of continuity, and so forth are discussed in terms of their impact on U.S. data purchases and their decisions to buy MSS data, it is assumed that their foreign counterparts will respond similarly.

In this analysis, the U.S. Industrial category, the second largest purchasing group at around 30 percent of the EDC non-Federal distribution, is divided into two major sectors: firms concerned with the global search for petroleum and other non-renewable resources, and all other industrial applications. This division is necessary because of the maturity of the application of MSS data analysis in the minerals industry versus the preliminary applications in other industrial user groups; differences in needed remote sensing and information extraction technologies between the two sectors; differences in past data purchasing patterns; and most importantly because of significant differences in perceived price sensitivities.

The Academic category includes those who buy MSS data for research or teaching, plus those who buy data to provide value added information extraction services for sponsoring state and local government organizations or others sponsors. This category of users orders around 10 percent of the EDC non-Federal output.

The State and Local Government category represents users who perform important functions for their government clients and whose output contributes to valuable public services, yet this category represents a small market for data. Typically this category of users purchase only a few percent of the data distributed by EDC.

(1) Historical Use (Fiscal Years 1978 through 1982)

The 1978-1982 period was one in which NASA and some portions of industry made great strides in understanding how to extract useful information from the MSS data. Three major, successful efforts were made, and other non-Federal programs were begun but

have not yet reached maturity. These efforts could have a large impact on the present and future market for satellite-derived land remote sensing data.

One major effort made by the United States was to promote the understanding of the Landsat program and the value of the MSS data in developed and developing nations. The efforts of NASA and the Agency for International Development have established Landsat and its MSS as a recognized, valuable technology around the world. The volume of purchases from EDC by the Foreign category of users plus the sales by foreign distributors amply demonstrate the success of this effort, as does the existence of eleven foreign ground receiving stations.

A second major successful effort was the development of the capability to extract information from MSS data that is important to geologists, particularly those in the minerals industry. Several major firms have invested heavily in developing in-house analysis capability. Others have explored the use of MSS data, and important value added services to this industry have evolved. This community of users has made very large data purchases from EDC. The visible and vocal support of this industry for the Landsat MSS and TM programs, as well as for future remote sensing capabilities, clearly demonstrates the maturity of the use of space remote sensing in this industrial sector.

Although the success of a third effort is not as visible from the market perspective, NASA's efforts to demonstrate the Landsat technologies to state and local governments have been fruitful. As of May 1981, the National Conference of State Legislatures reported that 26 states and 135 local or regional entities used or were developing the capability to use MSS data. A total of 594 Landsat applications in the states were documented. Of these, 241 were considered to be operational, and 40 to be routine/continuous. In addition, 131 potential future applications were identified but had not yet been attempted in particular states. The states had expended almost $10.8 million of state general funds plus $15.6 million in state-controlled Federal funds in establishing capabilities, training people, and operating user programs.

Other isolated efforts to promote non-Federal use of MSS data

have been successful but a major market impact has not yet been observed. One major lumber company has developed and adopted the technology to inventory and manage its major timber holdings in the southeast. Another firm tested the utility of Landsat to monitor production of cotton in other nations, but has now shelved its plans for investment in an operational capability. Some construction and engineering firms use MSS data in reconnaissance surveys for dams and other large engineering structures, particularly in lesser developed countries. While these examples are encouraging, they are not an indication that there has yet been wide acceptance of the Landsat technology in the non-minerals portion of U.S. industry. This situation could change when Thematic Mapper data with its higher spatial resolution becomes generally available.

During this period, EDC sold to non-Federal users almost 164,000 MSS scenes in imagery form and 14,800 scenes in digital form for a total of 178,800 scenes. NASA provided some scenes directly to non-Federal users, but the number is believed to be small enough not to distort the user statistics derived from EDC's sales records. Table B-15 shows the percentage of these EDC non-Federal sales to each of the user categories for each of the years in the development effort. This non-Federal sales record is also plotted on Figure B-3.

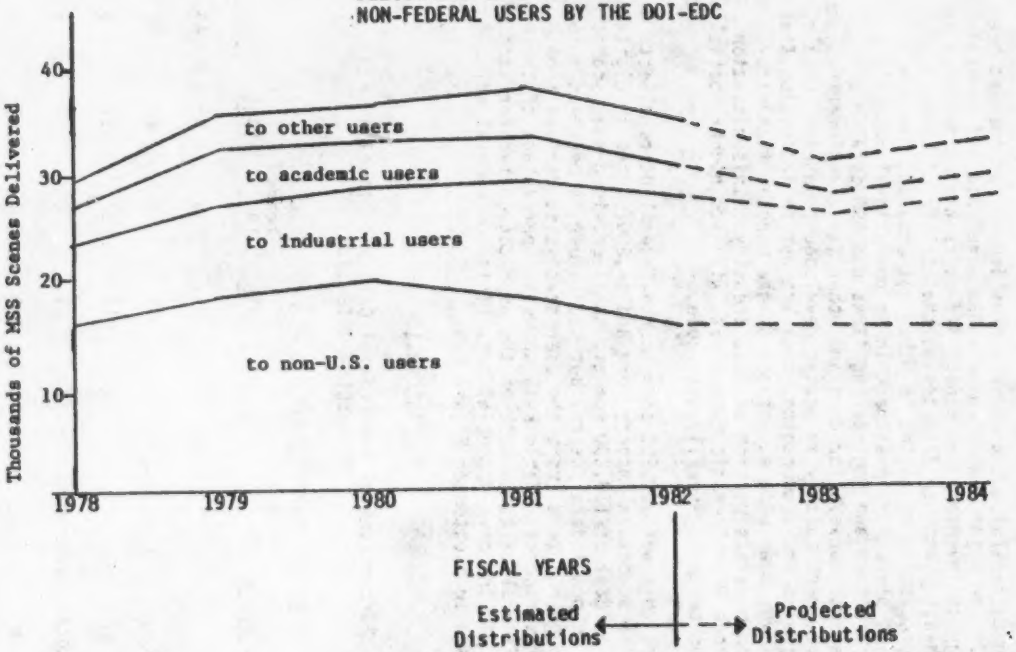
TABLE B-15

Percentages of Non-Federal Data Distribution
from EDC - 1978-1982

Category	Years 1978	1979	1980	1981	1982
Foreign	54	51	53	49	44
Industrial	26	25	24	29	35
Academic	12	14	12	11	8
State & Local Government	2	1	4	3	5
Individuals	6	9	7	8	8

FIGURE B-3

DELIVERIES OF LANDSAT MSS DATA TO NON-FEDERAL USERS BY THE DOI-EDC



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(2) Present Use (Fiscal Years 1983 and 1984)

The discussion of the historical use of Landsat MSS data by Federal users included the uncertainties in extrapolating present and future demand based solely on historical delivery figures. In the case of non-Federal users, extrapolation is not complicated by the large number of scenes distributed without charge because these non-Federal users discussed have all bought their data. These users are now faced with much higher unit prices for the data they buy, however, and it is expected that each major user group will have different sensitivities to these higher charges. Other conditions, including perceived market saturation in one particular user group, will influence present demand, as will concerns over data continuity and other factors. In contrast with these "down side" conditions, there seems to be a general historical increase in the use of MSS data by certain groups of about 3 percent per year for imagery and 10 percent per year for digital data. The impact of these factors on each of the major non-Federal user groups is discussed below.

In developing the figures for present demand, a simple formula was used to calculate FY 1983 sales based on 1982 sales. This formula is: The 1983 volume equals the 1982 volume, times a growth factor which represents trends within a particular user group, times a second factor which quantifies perceived price sensitivity for each group.1/ Since it is believed that growth

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1/Price sensitivity estimates are quantifications of subjective estimates of the reduction in volume demand caused by an increase in the average unit price of MSS imagery from approximately $15.70 in FY 82 to approximately $45.00 in FY 83 (190 percent increase) and an increase in the cost of an MSS scene in digital form from $300.00 to $650.00 (117 percent increase). It should be noted that prior to FY 82, prices for imagery had risen very slowly to adjust for inflation, but that the cost of digital data had not changed from an introductory price of $250.00 per scene. Thus, the FY 83 prices for imagery are 3.4 times that charged in FY 81, and the price of digital data is 2.6 times that charged in earlier years. Changes in demand due to pre-FY 83 increases are not considered indicative of the market responses to the recent very large increases. Price sensitivities used in these calculations were derived from very limited results of surveys conducted by NOAA at user conferences in 1980 and 1982, and from discussions with representatives from most of the domestic user groups.

factors and price sensitivities for each particular user group are different for imagery products and digital data, these calculations were repeated for each form of data for each user category.

Since there are no additional increases in the price of MSS data now planned for FY 1984, no further price sensitivity reduction in the demand for MSS products was calculated and indeed it is expected that the demand will "rebound" slightly as is common for many product demand reductions following a major price increase. The increased tripled prices for MSS data have now been in effect for only two months, a period that is far too short to test definitively the validity of the assumptions on price sensitivity.

The Industrial Category

Users in the minerals extraction portion of the Industrial category generally represent a group which is very experienced in the routine use of Landsat MSS data, and which can be expected to continue as a strong market for MSS data and for data from new satellite-borne remote sensing systems. Some firms in this group made large purchases of MSS data in the past few years. As they developed more confidence in their capability to extract useful information, these firms established their own inventories of data holdings over areas of the world in which they have an interest. These holdings include scenes acquired during the four climatic seasons (spring, summer, fall, and winter) and the data market from these firms is now saturated. Other firms in this category, encouraged by the experiences of the pioneers, are cautiously moving into this technology. Minerals resources firms make extensive use of digital data analysis because more information can be extracted from the data and because derived information can be integrated efficiently with information from magnetic, gravity, seismic and other surveys. Data collection budgets for firms in this industry are usually very substantial and the cost of MSS data, even at the present higher charges, is not a major barrier to purchases. These factors would all argue that MSS demand by the minerals extraction industry would remain relatively strong in the immediate future.

Countervailing trends in this industrial sector are that the excess worldwide supply of petroleum and the stable-to-declining prices for petroleum products have reduced to some extent the more speculative efforts to seek new potential sources of petroleum in favor of further in-situ development of areas of identified production potential. Since MSS is more valuable to the speculative searches than to production development, some decline in the demand for MSS data can be expected. Furthermore, some firms which are now exploring their routine use of Landsat data may move slowly with MSS data in anticipation of the different and more expensive analytical capabilities needed to use Thematic Mapper or SPOT data.

Non-minerals firms in the Industrial category are not expected at this time to substantially increase their demands for MSS data. Those firms which routinely use MSS data are expected to continue to do so, although the new, higher prices will make customers much more selective in their orders since data acquisition budgets are generally limited.

In summary, it is likely that the momentum of program and investment decisions made in prior years will continue the growth factor for industry as a whole into FY 1983, but its continuation into FY 1984 is far from certain. In this analysis, the FY 1983 "growth factor" used was an increase over FY 1982 demand of 11 percent. Reduction in industrial volume demand due to the higher costs for MSS data is expected to be on the order of 16 percent. "Market Rebound" for FY 1984 is expected to be around 5 percent of the fiscal year 1983 volume demand. In total, it is expected that there will be no change in industrial volume demand between FY 1982 and 1984 (the calculated net two year change is less than one percent).

The Academic Category

Severe funding problems facing the nation's academic institutions in the foreseeable future can be expected to have their impacts on academic purchases of MSS data. Teaching budgets are likely to be reduced, and government funds for

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research will be much harder to get. Conversely, private funding for "directed" research may increase, but this is by no means certain. It is expected, however, that sponsors of research involving the use of Landsat data can be persuaded to cover the increased data costs. For those academic institutions which perform analyses of MSS data as "value added" services to state and local governments and other clients, there is no clear evidence at this time that service budgets (including data acquisition budgets) will change significantly one way or the other in FY 1983 and 1984.

In calculating the FY 1983 demand, a growth factor of one percent per year was used. Since academic users are thought to be very price sensitive in these times, a price sensitivity factor was used which reduces FY 1983 demand by 26 percent, and the FY 1984 "Market Rebound" factor used was an increase of 8 percent. The net effect of these calculations shows an FY 1984 increase over FY.1982 of 8 percent.

The State and Local Government Category

From the market perspective, state and local governments represent a small present or potential source of revenue. Each of the user programs requires one, or at the most a very few MSS scenes, to accomplish a given analytic purpose. MSS data are very important to these user programs, however. It has been suggested that one of the major motivations for state and local government use of Landsat data was the monitoring requirements under Federal environmental protection laws. Whether this level of monitoring will be maintained as states assume more responsibilities for environmental protection cannot be determined at this time. Analyses of MSS data is a cost effective tool for some of this monitoring, as it is for a variety of applications in the management of natural resources under state or local control. State and local governments are thought to be quite sensitive to increased data prices, however. The continued existence of some of these user programs, as well as the fate of additional programs that had been planned for future implementation, will depend in some measure on the perceptions of the state and local

governments on the continuation of the Landsat program (under management by the Federal government or industry) and on the provision of data at prices they feel they can afford.

In calculating demand by this user group in fiscal years 1983 and 1984, the following factors were used: Growth -- it is assumed that fiscal year 1983 demand would be 5 percent greater than fiscal year 1982 requirements; Price Sensitivity -- fiscal year 1983 demand will be reduced 36 percent because of the higher data prices in fiscal year 1983; "Market Rebound" -- 16 percent more data will be purchased in fiscal year 1984 than in fiscal year 1983 as users have the opportunity to accommodate their needs within their budgets. The net effect is that fiscal year 1984's volume requirements will be 22 percent less than in fiscal year 1982.

The Individual Category

There is no clear information on the content of this small user group, or on their responses to cost and other factors which affect future demand. Therefore, the factors used in calculating their probable FY 1983 and 1984 demand are roughly equivalent to those used for state and local government users. The result of these calculations is that demand by this segment of the market in fiscal year 1984 will be about 20 percent less than in fiscal year 1982.

The Foreign Category

This category is an amalgam of user groups, as discussed earlier. Some parts of it will respond in the market sense as will U.S. Federal users; some like U.S. industry; and some like U.S. academic and state and local governments. These similarities would lead to predictions of future demand that are very similar to those discussed above.

There are some differences, however, which can be noted here but which, without a major new international market survey, defy quantitative analysis. One of the principal differences is that for many developing nations, Landsat's MSS provides the only reliable, inexpensive source of current data on a variety of natural resources. This could motivate increased purchases.

Many of these nations have depended on foreign aid such as that provided by the Agency for International Development for funds to purchase and analyze Landsat data. The future availability of funds for these purposes is uncertain, and the demand for MSS data could decline. The present strength of the dollar on the market may force foreign purchasers to buy from foreign distribution points rather than from the EROS Data Center, thus reducing EDC's sales.

Taking all the above into consideration, it is assumed that foreign demand in fiscal year 1983 would grow by 12 percent, but that this demand would be reduced by 16 percent because of price sensitivity, and that the fiscal year 1984 "Market Rebound" would be five percent over 83 levels. The net result of these calculations is that foreign volume demand in fiscal year 1984 would be about five percent greater than in fiscal year 1982.

(3) Potential Use (Fiscal Year 1985 and Beyond)

One question concerns the impact on the market for MSS data of the availability of data from Landsat's Thematic Mapper and from the SPOT satellite system. There is considerable debate over the answer to this question. One school of thought is that MSS data is complementary to data from TM and SPOT. People who hold this view see the MSS as being used in two fashions: (1) as the primary observing capability for programs, such as crop monitoring in most of the areas of the world, where the higher resolution from SPOT and TM is not required (in their view a low-resolution system such as MSS is the most economical observing system because of the much higher costs to process higher resolution data); and (2) as a reconnaissance tool to identify where higher resolution (and higher cost) data should be obtained. People who hold this view would see the future market for MSS data as being stable or increasing slowly in the future. Other people take an opposing view, considering the MSS as an observing system that "has had its day" and that will pass into history as the TM and SPOT data become readily available in the second half of the 1980s. People who hold this view tend to believe that continued rapid advances in computer hardware and software will permit the development of special low-cost computers that will make digital processing and information extraction of high resolution data almost as economical as

today's processing of MSS data. This, they argue, removes the major economic advantage of a low-resolution multispectral scanner system, such as MSS, while permitting the extraction of the much higher information content in high-resolution data. People who hold this latter view see the demand for MSS data declining rapidly until no more MSS-type data are needed in the post-Landsat D' period (circa 1987 or 1988).

Three corporate activities fully demonstrate the divergent points of view with respect to the future market for MSS-type data. One U.S. firm is working to build, launch, and operate its own low-resolution sensor systems. Although this company plans to use a different sensor technology than the Landsat MSS, the 80 meter, four spectral band data would be almost identical to that now available. This company expects to market its data with sufficient returns to finance the entire venture without government support. Whether this company's technical and marketing plans come to fruition, clearly the company believes in a long-term market for MSS-type data. A different U.S. firm, one with many years of experience in the operational use of MSS data, conducted a survey of the U.S. market for SPOT data. The study was sponsored by the French. One of the conclusions of this study was that the MSS and SPOT systems would be complementary, and that each would serve a unique portion of the total market for space remote sensing of the Earth's surface. It is interesting that this study perceived SPOT as being much more competitive with aerial photography than with the MSS data. Still another firm proposes to take over the Landsat satellites and replace the MSS with a higher resolution sensor system designed to provide stereoscopic data. Evidently this firm sees no continuing market for low-resolution, MSS-type data.

The views of these firms notwithstanding, it is probable that the future of the market for low-resolution MSS-type data is somewhere between the two extremes expressed above. There will always be users who would like to have the greater information content derivable from high-resolution data, but who must accept the lower information content extractable from an affordable data delivery and processing system. Users in this category are those who must routinely process large amounts of data (thousands of scenes) to achieve their objectives. The relatively inexpensive, high volume computers suggested above will probably become available in time, but will they become common in time to

eliminate the need for MSS-type data in this decade? On the other hand computer systems capable of processing modest amounts of TM or SPOT data now exist in the hands of those users (e.g., in some Federal agencies and in some firms in the minerals industry or service companies which serve the industry) who need and who are willing and able to pay to extract the greater information content. More existing computer capabilities can be applied when the information market dictates. For these particular users, the MSS could well pass into history very soon. Yet the number of users in this category is small.

Clearly the ultimate end of the market for MSS data is dependent on the availability of data such as those from TM and SPOT and on the generally available capability to process it quickly and economically. There is a "Catch 22" here. The TM, for example, will not be a self-sustaining economic venture unless there is a sufficient market for the data from users who can afford to process it. Economical data processing systems will not become generally available unless there is a perceived continuity of TM-type data sufficient to warrant the development and marketing of the tailored processing system.

The "momentum" of past investments in development and transfer of information extraction technology can continue to have a positive impact on the market for MSS data for a while, but the effects of these past investments could die out by 1985. It is suspected that the major market benefits from these developments, particularly as they relate to MSS use in non-renewable resource applications, may have already been felt. It was assumed that demonstrations of renewable resource applications through government programs such as LACIE and AgRISTARS would promote the transfer of this technology to the private sector and generate a large non-Federal market for MSS data. New applications areas could evolve and result in significant new demands for MSS data.

(4) Summary of Present Non-Federal Demand for MSS Data

Analyses of the calculations of probable non-Federal demand in fiscal years 1983 and 1984 for MSS data sold by the EROS Data Center (plotted on Figure B-3) leads to the following conclusions:

- o Volume demand by all user categories will be lower in fiscal year 1983 than in fiscal year 1982. Total scenes delivered in 1983 will be around 31,600, compared with 35,600 in 1982; a drop of around 11 percent. This reduction is largely due to the fact that data prices increased by 200 to 300 percent in October 1982.

- o Volume demand in fiscal year 1984 will climb to around 34,000 scenes, an increase of 8 percent over 83, yet a decrease of around 5 percent from the 1982 sales volumes. This increase will be largely due to the "Rebound Factor."

- o If the projections for fiscal years 1983 and 1984 are accurate, revenues will be:

  (a) 1982: 35,600 units sold for around $2.6 million.
  (b) 1983: 31,600 units sold for around $5.3 million.
  (c) 1984: 34,000 units sold for around $5.7 million.

- o The validity of these volume projections and estimates of sales revenues depends on the user's sensitivity to the

October 1982 price increases more than any other factor. There is as yet, no clear evidence in the EDC sales records for the first two months since the higher prices went into effect that demand for MSS data is falling any further than projected.*

Early resolution of these issues on terms that are perceived by the non-Federal user community as responsive and advantageous to them, combined with an aggressive market development and technology transfer effort on the part of the private sector owner of the remote sensing system, would probably reestablish the MSS as a major component of an Earth resources observation system. In this case, annual increases in demand for MSS data of 10 to 20 percent per year through the mid to late 1980s could be expected.

3. Thematic Mapper (TM) Data

In contrast with MSS data, there is little TM data now available for distribution, and it is much more expensive. Through fiscal year 1982, the EROS Data Center had in its archives 409,895 historical MSS scenes available for reproduction and sale in imagery or digital form. According to present plans, this inventory of processed MSS data will grow by almost 48,500 scenes per year during the lifetime of Landsat 4 and Landsat D'.

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* Analyses of the EDS sales for the past six months show that using the average orders during June, July, and August 1982 as a baseline: September (pre-price increase) orders for imagery were up 70 percent and orders for digital data up by 230 percent, for a total increase of 83 percent; since the price increase, orders for imagery were down 47 percent from the baseline monthly average, orders for digital data were down 29 percent, for a total reduction in orders of 46 percent. The effects of the price increase, which reduced November and December orders, should diminish, with the 1983 monthly orders increasing somewhat.

This annual production figure could be reduced depending on demand, and the MSS production facility has the capacity to process up to 73,000 scenes per year if needed.

Through fiscal year 1982, there were only a few TM scenes processed to the point where imagery products were available, and no scenes were available in digital form for sale through the EDC. According to present plans, around 1,000 TM scenes in imagery form and approximately 450 TM scenes in digital form will become available for reproduction and sale in fiscal year 1983. With presently planned facilities, fiscal year 1984 should see this TM inventory increase by about 4,300 scenes in imagery form and 700 scenes in digital form. If additional equipment is installed in mid-1984 (as proposed in NOAA's fiscal year 1983 budget), figures for this year would increase to 7,100 scenes in imagery form and 1,800 scenes in digital form. When the Thematic Mapper production facility reaches its full planned capacity in fiscal year 1985, annual production should be approximately 18,000 scenes in imagery form and 3,600 scenes in digital form.

Until the first Tracking and Data Relay Satellite System (TDRSS) satellite is operational (scheduled launch is in April 1983), virtually all acquired TM data are over the conterminous United States. It is not until the second TDRSS satellite is operational (scheduled for launch later in 1983) that a global capability will be established to acquire TM data. According to announced plans it is expected that seven foreign ground stations will have the combined capacity to receive and process about 14,200 TM scenes per year in 1984 or 1985.

About 450 scenes are required to provide single scene coverage of the conterminous United States, and 9,400 scenes are required to view the rest of the land mass of the Earth one time. Since it is generally accepted in the user community that the optimum coverage in each area includes observations made in the spring, summer, fall, and winter, the optimum number of TM acquisitions for global coverage is 39,200. At the production rate planned for TM processing, it would take 2.2 years for global imagery coverage, and almost eleven years for global coverage in digital form. For some areas, such as over the United States, this seasonal coverage should be repeated each year to meet domestic user requirements, further lengthening the time to obtain an archive of global data. For many areas of the

world, good seasonal coverage obtained once need not be repeated more frequently than every five or ten years, except when climatic conditions change (e.g., to monitor the effects of a long drought) or when episodic events (earthquakes, floods, volcanic eruptions, for example) occur. Cloud cover is a major contaminant when viewing the Earth's surface from space. Obtaining scenes that are virtually cloud-free requires that, even using the best cloud cover forecasts available, roughly one out of two TM scenes brought to the ground will be processed to the product stage. Some areas of the globe are almost always cloud covered, and in a few areas good quality MSS coverage has not been obtained in the 10-year data collection program.

There was virtually no Thematic Mapper data prior to fiscal year 1982, so there is no historical precedent to establish trends leading to the present requirements. It should be noted, however, that NASA has worked with many potential Federal and non-Federal users, testing applications of TM data using data simulated from the output from aircraft-borne sensors. These tests have made many potential users aware of the high information content embedded in the satellite data streams, and have triggered the interest of many users, particularly those in the geological community. This community was instrumental in defining the TM's technical specifications. The TM is considered as particularly responsive to the unique needs of this user community.

Full cost recovery will be the basis for pricing. This would require that volume demand and unit prices be balanced to provide sufficient revenues to offset costs of routinely receiving, processing, and distributing Thematic Mapper data. Finally, TM prices should be competitive with those charged by SPOT Image for data from the SPOT satellite. Establishing TM prices today is difficult because: (1) The volume demand at any price has not been determined adequately and cannot be tested until sufficient TM data is available for the user's experiments; (2) The fiscal year 1985 production costs cannot be determined with certainty for a production facility at the Goddard Space Flight Center that is not yet fully built; and (3) The French have not published prices for SPOT data, perhaps because they are waiting for publication of U.S. prices for TM data so that SPOT prices can be competitive.

Since little foreign TM data will be available until the latter part of fiscal year 1983, foreign interests are expected to be high but there will be little data available for purchase. As soon as the capabilities permit, the NASA might be encouraged to acquire a few sample scenes over each nation. These samples would give to each nation the opportunity to explore first hand some of the uses of Thematic Mapper data. With only approximately 1000 scenes in imagery form and 450 scenes in digital form available in fiscal year 1983, most of these over the United States, few sales to foreign users can be expected. Fiscal year 1984 should see this situation improved when the two-satellite TDRSS and the enhanced data processing facilities are available. If 75 percent of this fiscal year 1984 system capacity were devoted to foreign acquisitions, over 3,000 scenes could be processed in imagery form and 500 scenes in digital form would be available for purchase by foreign users.

There have been no significant market studies for Thematic Mapper data. Lacking such studies, one can examine the number of domestic and foreign scenes probably available for sale, and assume the number of times each scene will be "resold." The magnitude of these "resale" figures is, of course, a matter of opinion since there are no historical data. It is known, however, that the magnitude is dependent on the unit charges for the data products (the higher the cost, the fewer the products will be sold), and on the number of scenes available for purchase (the more scenes that are available, the less often a particular scene will be purchased) particularly in the early years of the Thematic Mapper program when many users will buy whatever data are available to examine it and explore its use.

a. Federal Use of Thematic Mapper Data

(1) Present Use (Fiscal Years 1983 and 1984)

Of necessity, fiscal years 1983 and 1984 will be a period of testing and evaluation by most Federal users of TM data, although some users such as the Corps of Engineers and some programs in the Department of the Interior appear prepared to use domestic data operationally. Prior to the operational status of the TDRSS, acquisitions of foreign data will be quite limited, reducing the opportunities for Federal users with foreign missions (e.g., the Department of Agriculture and the Defense

Table B-16
Possible Sale of Thematic Mapper
Products to Federal Users
in Fiscal Years 1983 and 1984

	Fiscal Year 1983		Fiscal Year 1984	
Area of Coverage	Domestic	Foreign	Domestic	Foreign
Imagery Form	700	300	1300	3000
Digital Form	300	150	220	500
Possible number of "resales"				
Imagery Form	4	1	4	1
Digital Form	2	1/2	2	1/2
Possible Sales Volume				
Imagery Form	2800	300	5200	3000
Digital Form	600	75	440	250
Total	3400	375	5640	3250
Grand Total	3,775		8,890	

Summary of Federal Requirements

These estimates of volume demand appear reasonable for market assessment purposes until the user agencies have the opportunity to experiment with the TM data, while they are developing their longer range plans.

Over 70 percent of these projected demand are for domestic data, reflecting the greater availability of processed domestic data, as well as the fact that many of the processed foreign acquisitions may be over areas of particular interest to non-Federal users (e.g., the non-renewable resources industry) rather than Federal users interested in renewable resources.

(2) Potential Use (Fiscal Year 1985 and Beyond)

Starting in fiscal year 1985, approximately 18,000 new TM scenes in imagery form and 3,600 scenes in digital form will be added to the inventory each year. This means that there will be greater opportunity to acquire and process foreign scenes of particular interest to Federal users. Presumably, Federal agency tests and evaluations in fiscal years 1983 and 1984 will be successful. Finally, the agencies may have the opportunity in fiscal year 1985 and beyond to seek the funds required to purchase larger volumes of TM data. These factors lead to a possible Federal market for 20,000 or more TM products per year. At today's prices, this would represent an annual revenue of almost $8 million.

b. Non-Federal Users of Thematic Mapper Data

(1) Present Use (Fiscal Years 1983 and 1984)

Initial demand by leaders in the minerals resources category for TM data in both imagery and digital forms is expected to be quite strong, with several U.S. firms purchasing copies of most domestic scenes and all foreign scenes in certain areas of the world. The problem of the Landsat system operator will not be so much marketing to these particular firms, but in scheduling data acquisition and data processing to meet their needs during this two year period when capabilities are limited. Other industrial users can be expected to move more cautiously, with concerns over costs and data continuity influencing their decisions to adopt the TM technology in a major way. State and local government users will explore the use of the data, but their cautious interest will be governed in large measure by cost and data continuity concerns. Academic users are expected to pursue the TM technology aggressively, their enthusiasm being restrained by reduced research and data acquisition budgets as discussed under their MSS purchasing plans.

In estimating initial (fiscal years 1983 and 1984) demand for TM data (see Table B-17), it was assumed that in fiscal year 1983, each scene would be ordered an average of four times. In fiscal year 1984, it was assumed that twice as many users would buy data, but that since the "inventory" would be about three times the size of that in fiscal year 1983, the "resale" frequency of fiscal year 1984 scenes would average six times. If these "resale" estimates are correct, in fiscal year 1983 the non-Federal user community would purchase 4,000 TM scenes in imagery form and 180 scenes in digital form. The figures for fiscal year 1984 would be 25,800 and 4,300 scenes in imagery and digital forms respectively. A total of 35,900 TM scenes would be sold in the two fiscal years.

Table B-17:
Possible Sale of Thematic Mapper
Products to Non-Federal Users in
Fiscal Years 1983 and 1984

Area of data coverage	Fiscal Year 1983 Domestic	Fiscal Year 1983 Foreign	Fiscal Year 1984 Domestic	Fiscal Year 1984 Foreign
Number of scenes available				
Imagery form	700	300	1,300	3,000
Digital form	300	150	220	500
Probable number of "resales"	4	4	6	6
Possible Sales Volume				
Imagery form	2,800	1,200	7,800	18,000
Digital form	1,200	600	1,300	3,000
Total	4,000	1,800	9,100	21,000
Grand Total	5,800		30,100	

(2) Potential Use

As with the MSS data, there are conditions that will have a impact on the future non-Federal demand for Thematic Mapper data. The TM user technology is expected to mature rather quickly, since it builds on 10 years of user technology development for the Mulstispectral Scanner data. Because of its higher spatial resolution and its increased and improved spectral coverage, TM data will have the much greater information content needed by many users of land remote sensing data. Starting in fiscal year 1985, approximately 18,000 new TM scenes will be added to the inventory in imagery form each year and the inventory of digital data scenes will increase by 3,600 scenes annually, dramatically increasing the ability to respond to the users' data needs. These factors point toward an early and vigorous growth in volume demand.

On the other hand, the price of TM data, particularly in its digital form, is expected to be high (the present price of

$2,800 for a scene in digital form could be increased by fiscal year 1985). Many potential users may be unable to pay these amounts. Finally, SPOT data will come on the market in this time period, and it probably will reduce user demands that could or would have been met by the Thematic Mapper. SPOT's resolution is higher than that of the TM (20 and 10 meters compared to the TM's 30 meters), but the TM's seven spectral bands are more useful to many users than the SPOT's three bands. SPOT offers a stereoscopic capability that the Landsat satellite does not. Design and implementation of the SPOT ground data processing facility lags that of the TM, and the volume of preprocessed SPOT data initially may be more limited than that of the TM.

At this time it is not possible to determine the net effect of all these factors on the potential market for Thematic Mapper data. The terms and conditions of commercializing the Landsat program will ultimately determine the market. The conditions of private ownership on continuity of TM-type data will determine whether the TM will join the suite of routinely used remote sensing capabilities, or whether it will be a "once only" experimental system which will be used as long as it lasts.

4. Other Earth Resources Sensors

Before discussing potential commercial remote sensing systems, it is worthwhile to consider the characteristics of the users who create the data market. The needs of users in the earth remote sensing community can be placed into two categories from the market perspective:

- o needs for frequent data acquisition over a period of years,
- o needs for data acquired once (or at most a few times in the case of a requirement for seasonal coverage), repeat coverage either not required or required only every five or ten years.

At one extreme, monitoring and predicting the abundance of renewable resources--such as estimating global production of agricultural products important in world trade, for example--perhaps requires reobservation as frequently as every four days during critical periods of the growing season. At the other extreme, satellite-derived information on the topography of the Earth to a specified vertical resolution, once obtained, probably never needs to be reobserved from space.

Major users in the first category are in Government agencies today, and the private sector user's entry into this user category is uncertain. Volume demands tend to be high, on the order of 5,000 to 15,000 new acquisitions per year, and the timeliness of data delivery to the user is usually critical. Delivery in between two and five days after acquisition is considered optimum. Data are considered to be perishable, losing much of its value in a short time. The number of known users in this category today is small. There are a number of smaller governmental users, such as U.S. state and local governments, but their aggregate demand is quite small, perhaps a few percent of the acquisitions required by the major users. Since large volumes of data are required, unit prices must be kept low.

There are many users in the second category and most of them today are interested in non-renewable resources. Although there is a mix of government/non-government users, industrial customers offer the largest potential market for purchases of data. The number of "scenes" required by each customer in any one year tends to be relatively small, however, probably on the order of a few hundred. Timeliness of data delivery after acquisition is usually not critical, deliveries within a month or more after acquisition meeting most needs. Data are considered to hold its value for years after acquisition. Therefore demand by each user for data over a particular area with particular technical characteristics, once met, is not repeated. Since data volumes required by each user in this category tend to be low, low unit prices for delivered data are not as critical as they are to users in the first category.

These two major segments of the present and potential market for satellite-derived data are presented above as if they have unique and different remote sensing requirements. In many respects this is the case. Yet there are some common

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requirements that also can affect their purchases of data from new and different remote sensing instruments. Two examples will demonstrate these common requirements. The geological community, notably in the minerals resources industry, places high priority on satellite sensors which provide digital information on topography. Topographic contours are also of interest to those users in the renewable resource community who need to calculate rainfall run-off in estimating the moisture that reaches a plant's root zone. Topography is a lower priority to renewable resource programs than it is to the geologists, and in many cases these two user groups are interested in different geographic areas. The two group's requirements for the accuracy of the topographic information also can be quite different. Another similarity in requirements is the common use of multispectral data, such as that available from Landsat's MSS and TM. Renewable resource programs use multispectral data to identify various crops, types of trees, and rangeland cover, and to assess the degree of vegetative stress induced by weather conditions or disease infestations. Non-renewable resource users derive from the data information on various types of soils and rocks and, in some cases, on the local effects on vegetation induced by the presence of certain minerals in the soil. Multispectral data remain a high priority need of the renewable resource community, but with the large inventory of global MSS coverage and the anticipated inventory of TM data to be built during the lifetimes of Landsat 4 and D', new instruments to acquire multispectral data are lower priority for the geological community.

Understanding the differences and similarity of the needs of these two major segments of the data market will be helpful in evaluating the potential market for data from new and different sensor systems discussed below. This section concludes with views on a few specific future data needs of the user (rather than on sensor systems).

a. Sensor Systems

(1) Multilinear Array (MLA)

The Multilinear Array is a solid-state, charged-couple sensor technology that is expected to replace the electromechanical sensing devices used for the MSS and TM. Today's MLA detector

technology can already provide data in many of the spectral bands observed by the MSS and TM, although observations in some of the TM bands are beyond the present state-of-the-art. MLA technology probably is of more interest to the satellite owner/operator than it is to the data user community, generally speaking. MLA sensors offer the potential for lower weight, longer lasting, more cost-effective sensor systems that should make investments in commercial operational satellite systems more attractive. Because of certain technical sensitivities and efficiencies in measuring incident radiation, charged-coupled detectors may provide to the user a bit more derivable information, but otherwise the user would see no significant difference in the delivered data. Thus, with the exception of possible lower unit prices for data from a more efficient, longer lasting space segment, the availability of the MLA should not, of itself, materially impact the demand for multispectral data of the MSS-type or TM-type.

From the user's perspective, the MLA technology is more likely to make possible two observational capabilities that have significant market potential: the provision of higher ground resolution and the availability of stereoscopic coverage needed to provide information on terrain. These potential capabilities are discussed later in this section. It is sufficient here to note that the smaller size of an MLA device, combined with the potential for much longer sensor lifetime in space, make the provision of these data services more feasible (technically and economically) than is possible using electromechanical scanning devices such as the MSS and TM.

(2) Synthetic Aperture Radar (SAR)

The SAR, flown on the SEASAT satellite and aboard the Space Shuttle has already demonstrated that this observational technology is quite interesting to the geological user community. The radar reflectance of different types of soil and rock create quite different appearances in the SAR data that have been processed to imagery form. Little SAR data have been digitally processed by the user community, but the information content is expected to be quite high. Because of the SAR's very high data rate, routine digital data processing may be some years away. Radar has one major advantage to most geological users in that it penetrates vegetation giving information on rocks and

soils not available from other satellite sensor systems which observe in the optical or thermal portions of the electromagnetic spectrum. Some users believe that a SAR might provide more information on the moisture content of the top few centimeters of soil, an important clue on the moisture available in a crop's root zone.

Canada, ESA, Japan and other nations are considering the development of an operational SAR system with radar frequencies and observation angles tailored for observations of the oceans and ocean ice. These SAR characteristics are different, however, from those that are optimum for observing the solid Earth. Renewable and non-renewable resource users will use whatever data they can get, and a limited market for ocean-oriented SAR data may evolve. Whether a land-oriented SAR system could be developed and operated in the next decade on a self-sustaining basis is problematic. Certainly the sensor technology exists and there is interest in some parts of the user community, but the economics of a commercial venture providing global capability are at best questionable. A commercial venture routinely providing SAR data in areas beneath Shuttle orbits is possible, but the data market would be limited because the Shuttle's orbit is restricted (for operational reasons) to about 28° north and south latitude.

(3) Large Format Camera (LFC)

It has been suggested that a surplus optical system from another satellite program could be used to build a shuttle-launched, free-flying satellite system in low Earth (polar) orbit to obtain photographs of the Earth from space. Under this concept, films containing high resolution images of the Earth would be recovered by the Shuttle when the film supply is exhausted. The resupplied satellite would be returned to orbit. It has been suggested by one firm that such a program could be operated on a commercial basis. The technology for such a venture exists. Aside from some major national and international concerns over the broad availability of very high resolution photographic imagery, there appears to be no real barrier to global commercial marketing of such photographs. Whether the investment in satellite design and fabrication, plus operational costs including shuttle launch of the satellite and retrieval of exposed films, can be recovered through sales of the images is yet to be determined.

b. Specific Future Data Needs

(1) Higher Resolution Imagery or Digital Data

Some users have specified needs for data with ground (spatial) resolution as high as two or three meters. Users of domestic data with these resolution requirements are now satisfying their needs with aerial photographs or other aircraft-derived data. Very high resolution requirements for foreign coverage are either met with aircraft data today or they are not met at all. It is probable that these resolution requirements could be met with a Large Format Camera system, but as stated earlier, it is not certain that satellite operational costs could be recovered through sales of images. The international concern over the public availability of very high resolution imagery would not, of course, apply to a commercial LFC system used only over the United States, but such a restriction on the system's use would severely reduce the market for sales. For this restricted use, aircraft imagery would probably be more cost-effective.

The next level of ground resolution required by the users is in the ten to twenty meters range. Both the LFC and MLA can provide images in this resolution design range (these are the design resolutions for SPOT which will use an MLA) and the MLA would automatically provide digital data. A Synthetic Aperture Radar could probably also meet these resolution requirements. Based on data market projections for Thematic Mapper and SPOT data, there appears to be a strong international demand for this data in imagery and digital form. It seems certain at this time, however, that initial demand for TM and SPOT data will not produce sufficient revenues to recapture costs of operating either of the systems (command and control, data relay, preprocessing the data, and developing the market) and amortizing the capital investments in the space and ground segments. The more optimistic projections of demand at unit prices now contemplated would provide sufficient revenues to cover only the TM's operational costs starting in fiscal year 1985, and perhaps a bit later for SPOT. There are no known projections of system costs and revenues which indicate that a commercial 10- to 20-meter satellite remote sensing system would be fully self-sustaining in the next 10 to 20 years.

The final resolution level considered by most users is 80 meters (or more) -- the resolution now provided by Landsat's MSS. The MSS, TM, SPOT, LFC, MLA and SAR can all meet this resolution requirement. As discussed earlier in this market analysis, it is clear that the revenue from sales of data in this resolution range in the next few years can at best meet systems' operating costs without amortizing capital investments. It is the feeling of most analysts that an aggressive marketing program by a commercial enterprise ultimately would increase the demand for data and derived products to the point where a commercial venture would be self-sustaining.

(2) Stereoscopic Coverage

In conventional mapping, terrain information is derived by placing two aerial photographs of an area (taken at slightly different angles) in a plotting device and deriving contour lines which then portray the Earth's elevations. This conventional photogrammetric method can produce terrain data in line form or in digital form. Acquiring aerial photography is expensive, particularly over foreign areas, and there are areas of the world where aircraft photography is not permitted. Some commercial enterprises do not wish to disclose prematurely their interests in a particular area by requesting approval to conduct aerial surveys.

These photogrammetric techniques can be extended by substituting satellite-derived images or digital data for aircraft-derived data. Electromechanical scanners, such as the MSS and TM, and the MLA are capable of producing the required images, provided provisions are made for viewing the earth at the complementary angles required in photogrammetric analyses. Indeed the SPOT system, which uses an MLA sensor, includes this stereoscopic capability with its provision for side-looking observations of an area from adjacent orbital overpasses. A U.S. system has been proposed which would provide for fore and aft viewing along the satellite's track to provide stereoscopic coverage. The Large Format Camera could be operated like an aircraft mounted camera to provide stereoscopic coverage. It would provide a series of films that could be used with conventional photogrammetric plotting systems. Any multispectral

scanner satellite system configured for stereoscopic viewing offers the advantage that terrain analysis could be accomplished using computers. The resultant product in digital form is most easily integrated with other digital data sets on gravity, the magnetic field, thematic information (such as soil types, vegetative cover, roads, and so forth) and other information of interest to a broad user community. The SAR can provide qualitative information on terrain and land form, but it is not clear at this time how quantitative information could be derived routinely. Radars, as mentioned earlier, offer an important advantage in that radar energy penetrates clouds and vegetation.

It is not likely that satellite-borne sensors will ever meet all the needs for terrain data. For example, meeting engineering requirements for one or two foot contour intervals appears to be either technically infeasible from space or feasible only at a cost that is so prohibitive as to be virtually impossible. Analyses have shown that by using present technology on satellites in low Earth orbit, it is technically feasible to produce terrain data which meet national map accuracy standards for mapping at 1:50,000 or smaller scales, and which meets the specific needs of the geological community. The minerals extraction industry has placed this stereoscopic capability at the top of its priority list of unmet data acquisition needs. The national and international mapping community considers this capability to be quite important for large-scale mapping in lesser developed areas of the world where quality terrain data do not exist.

From the market perspective, there appears to be a substantial short and long term demand for satellite-derived stereoscopic data. Quantification of this demand must await: technical decisions on the satellite sensors to be used and on the accuracies with which terrain information can be extracted; policy restrictions (if any) on resolution or data dissemination which might be imposed for national security or foreign policy reasons; establishment of costs to the user to purchase the satellite data and understanding of the user's costs to process the data; and, above all, the results of an aggressive market development program by a commercial owner of the satellite system.

C. Oceanographic Data

1. Introduction

For centuries ocean shipping has been the primary medium for international commerce, and mankind has harvested fish from the oceans as a source of food. In recent years, the world population expansion and resulting shortages of food, fuel, and minerals have focused increased attention on the oceans. As commerce has increased, cargo vessels have become larger and more costly to operate, and the weather and ocean conditions that they will encounter enroute are carefully considered in an effort to improve their productivity. In many nations, ocean fishing has become a highly systematic activity that makes extensive use of advanced technology to reduce costs and increase the value of the catch. The oceans have also become a major region for the exploration, development and production of petroleum resources, and the exploration of the seabed as a source of minerals has begun. As resources in regions of benign weather are depleted, the frontier has been extended into regions of relatively adverse weather, such as the North Sea, the Arctic, and the Gulf of Alaska. This move has been accompanied by a growing recognition that the ability to accurately forecast climate and weather in frontier regions is an important factor in the cost of these offshore operations.

2. Federal Uses

As with weather satellite data, the major governmental users of ocean data are the National Weather Service and the Department of Defense. Their primary use is as input in forecasting the weather and climate. Additional uses are for ship routing for

both NOAA and U.S. Navy ships; preparation of ice analyses and forecasts; and forecasting sea fog formation and dissipation. Other Federal users include the National Marine Fisheries Service, the U.S. Coast Guard, and the Environmental Protection Agency.

The National Marine Fisheries Service uses data from the Coastal Zone Color Scanner which has been flown experimentally on the NIMBUS satellite. Applications include statistical analysis of pigment distributions; analysis of the distribution and characteristics of phytoplankton blooms, including related temperature distributions; and the examinations of relationship between fish concentrations observed by hydroacoustic methods or fish catch reco[illegible]motely sensed temperature gradients.

The use of satellite communications to the fishing fleet has been successfully demonstrated in the Gulf of Mexico. Information on bottom-fish and shrimp size and composition was transmitted in near real time through the ATS-3 satellite and the NOAA ARGOS Data Collection System to shore stations for distribution to fishermen, fishing associations, state fishery managers, researchers, and Federal investigators. The demonstration showed that fishery information could reach the users very quickly. The tests were judged highly successful by all participants.

Ecological effects of hurricanes have been evaluated through analysis of CZCS data along the Gulf coastal area of Mexico. In 1979, the Gulf of Mexico experienced two major hurricanes, Frederick and Henri. These hurricanes directly or indirectly led to significant upwelling along the Mexican coast which caused a major phytoplankton bloom observed by the CZCS. The impact of the bloom on fishery resources is not known.

There was a unique opportunity to apply satellite thermal data to a potentially catastrophic environmental event affecting shrimp resources in the northern Gulf of Mexico. A large area of ocean bottom water off the coast of Louisiana was found to have low oxygen levels. While low oxygen levels had been reported previously, its areal extent and potential impact on shrimp moving from inshore estuarine nursery areas to offshore shrimp fisheries had not been established. Evaluation of the thermal

data showed a high degree of correlation between areas of low oxygen and pools of unusually warm surface waters. Presumably, these warm surface waters cause thermal stagnation, which coupled with high organic loads, result in low oxygen content.

Besides chlorophyll and phytoplankton bloom analyses, ocean color data were used in conjunction with thermal data to map distribution patterns of bluefin tuna in the Gulf of Mexico. This mapping has been highly successful and includes surface truth data collected by observers on Japanese tuna longline vesels in the United States Fishery Conservation Zone.

NMFS has also used satellite communication capability to successfully track adult sea turtles as part of their conservation efforts.

The U.S. Coast Guard uses satellite data in their Search and Rescue efforts. The Coast Guard will also operate the Search and Rescue Satellite-Aided Tracking (SARSAT) ground stations associated with North and Central America Marine Search and Rescue missions. The U.S. SARSAT space segment will be deployed on the NOAA-E satellite beginning this year.

The Environmental Protection Agency has used satellite-derived data for detecting and tracking oil spills, and estuarine discharges of chemical and other industrial pollutants.

3. Commercial Potential

a. Ship Routing

Optimum ship-routing techniques have been used by commercial vessel operators for about 15 years. The services of commercial ship-routing firms are purchased by vessel operators for the purpose of reducing fuel consumption, transit time, and damage to vessel and cargo due to exposure to severe weather. Perhaps the first experiment in ship-routing done using only satellite remote sensing was performed jointly by the Exxon Corporation and the National Oceanic and Atmospheric Administration after the launch of NOAA 2. This satellite allowed the enhanced infrared measurement of sea surface temperatures.

Eleven Exxon tankers transiting between ports in the Gulf of Mexico and on the U.S. east coast participated in the experiment conducted for seven months during 1975. Five of these tankers were instructed to follow usual company navigational practices. The other six used the satellite analyses provided by NOAA. For these analyses, NOAA examined the satellite infrared images of the Gulf Stream area, located the large thermal gradient along the western boundary of the stream known as the "Western Wall," and estimated the axis of maximum current velocities relative to the Western Wall. Exxon then radioed the location of this axis to their tankers at sea. The experiment showed that satellite analysis of the position of the Gulf Stream could reduce transit time and save fuel for tankers navigating along the Eastern Seaboard.

It has been estimated that about 25 percent of all ships over 5,000 tons use routing services. Generally, the most important consideration in ship-routing is sea state. However, currents, winds, and hazards to navigation such as ice, are also important factors. In a retrospective analyses of Seasat data by a U.S. ship-routing firm, it was estimated that satellite ship routing would save up to 10 percent in transit time on long voyages. This would translate into a savings of $15,000 to $40,000 for a typical Pacific voyage. The study also indicated that every third Pacific storm is incorrectly located by conventional means by at least 180 nautical miles. It has been estimated that merely improving our knowledge of the location of storm centers through the analyses of satellite data and applying that knowledge to ship routing could result in savings of $2.7 million per year on U.S./Far East routes and $1.2 million per year on southern Indian Ocean routes.

b. Fisheries

Weather and sea conditions affect all aspects of fishing vessel operations, including transit to and from the fishing grounds, the deployment and retrieval of the fishing gear, and the actual netting of the fish. The oceans have claimed many of those who go down to the sea to fish, and the hazards of the occupation are especially great in areas such as the Bering Sea and the Gulf of Alaska. The loss of vessels and crew during fall and winter fishing in these areas due to wind, sea states and icing conditions is a risk of the trade, but a risk that

satellite observations may be able to ameliorate. An analysis of Seasat data has shown that the forecasting of such hazardous conditions may be substantially improved through satellite observation of sea surface temperature and sea surface wind.

Satellite observations also hold great promise of reducing the effort expended by the fishing industry. Satellite observations of the color of the ocean water can indicate regions of upwelling or convergence of ocean currents -- areas likely to be richer in nutrients in the surface waters and therefore more attractive to marine life. Because most species of marine fish show a marked preference for certain temperature ranges, satellite observations of sea surface temperatures provide valuable information concerning where particular species of marine fish may be found. The combination of observations of color and temperature with additional satellite-derived data such as surface winds and currents can be analyzed to indicate areas where fishermen are most likely to find their target species.

An operational experiment is currently underway to assess the applicability of satellite observations in the U.S. West Coast albacore and salmon fisheries. Measurements of ocean surface color and temperature obtained by Nimbus-7 are being used together with other conventional and satellite observations to create charts indicating areas where albacore and salmon are most likely to be found. The charts indicate those properties of most interest to commercial fishermen, including the boundaries of temperatures prevailing in the area in which the target species are most likely to be found, convergences that indicate the possibility of squall activity or concentrations of nutrients attractive to marine life, and wind and wave information useful for the actual operation of the fishing vessels. Daily radio-facsimile broadcasts make the charts available to fishing vessels at sea. The experiment is being continually evaluated by the participating commercial fishermen, and it has to date shown potential for increased efficiency.

c. Ice Surveillance

Ice surveillance from space in polar regions provides information on ice coverage, extent, and movement, along with definitions of openings and leads. Such observations greatly aid the navigation of tankers and other merchant vessels in these

regions and fishing vessels along the ice edge. Ice breaking tankers costing on the order of $300 million per vessel are scheduled to begin operations in the Canadian Arctic in the 1988-1990 time period. They will require extensive knowledge of sea ice coverage and dynamics for navigational purposes. Offshore oil and gas operators in the Arctic regions require surveillance of ice dynamics in order to conduct rig operations in a safe and efficient fashion. Industry studies have estimated that a significant percentage of aircraft ice reconnaissance (costing $4-$8,000 per day) could be eliminated through the use of space-borne synthetic aperture radar observations. Increasing the efficiencies of ship operations and reducing aircraft flights in the Arctic could eventually yield industry savings exceeding tens of millions of dollars annually.

d. Marine Mineral and Petroleum Exploration and Production

In an effort to evaluate the utility of satellite data to the ocean industrial community, the Seasat program involved that community in the evaluation of the performance of the Seasat system. Many ocean industrial firms became part of a cooperative venture between industry and Government known as the Seasat Commercial Demonstration Program. In that program, the government provided the firms with access to the observations and products produced by the Seasat system, while the firms provided at no cost to the Government an evaluation of the utility of the Seasat data and system to their operations.

The Seasat Commercial Demonstration Program indicated that the application of satellite data to the design of offshore oil and gas rigs could reduce by 10 percent the "overdesigning" and "overengineering" of these rigs due to the climatological uncertainties of conventionally acquired data. If this over-design of 650 existing rigs had been avoided, the savings would have been almost $3 billion. The application of satellite data to the offshore oil and gas industry also results in a significant reduction of "downtime" in the operation of drilling rigs and the more efficient utilization of offshore supply vessels through the reduction and avoidance of adverse weather conditions. Satellite ice surveillance in the Arctic assists the oil and gas industry in the design of facilities, the optimum deployment of drillships, and resupply operations.

Satellite-derived data are also of assistance in the design and installation of oil and gas pipelines on the sea bottom. Currents and surges of water which act upon these pipelines as they are being laid can be caused by swells from distant storms as well as local storm waves. The Seasat Commercial Demonstration Program has shown that an oceanographic satellite system can provide wave and weather data leading to improved design criteria for offshore pipelines.

Another industry which has operated in the "frontier" areas of both geographic setting and technology is the deep ocean mining industry. This industry is engaged in exploring the economic potential of seabed polymetallic deposits. The most promising area for the commercial recovery of nodules is the equatorial Pacific Ocean between Mexico and the Hawaiian Islands. This area lies outside the normal shipping lanes, with the result that observations of ocean and weather conditions by conventional means within this area are rather sparse.

Until now, the deep ocean mining industry has used wind and wave climatologies derived from conventional sources -- that is ship reports -- to design their equipment and plan operating strategies and exploration schedules. A disturbing result revealed by the Seasat Commercial Demonstration Program was that within the mining region, the Seasat data showed winds to be stronger and waves to be higher than the mining companies had believed on the basis of conventionally acquired data. If the Seasat data is the more correct representation of true conditions, the deep ocean mining companies will then be faced with the choice of either redesigning their equipment, or accepting production cuts in the recovery of nodules due to the presently designed equipment being unable to operate with as great a frequency as originally thought possible.

Satellite observations would also be of immense benefit to the actual operation of a potential deep ocean mining vessel. For example, the technology designed by Kennecott Exploration, Inc., requires 57 hours to either place the mining head on the sea floor or to recover it. Therefore an operational "window" of 114 hours is required just to deploy and retrieve the mining equipment. Additional time, of course, would be required for the actual recovery of any nodules. Only satellite observations of

the otherwise sparsely observed deep ocean mining area can provide the information necessary to assure the safety of the equipment from the effects of adverse weather. Lockheed has estimated that the effects of adverse weather would cost $20 million. In addition, Kennecott has estimated a loss of $1.8 million in revenue for each day of lost operations. Accurate warning of adverse weather by satellite would provide the mining operators with the options of lifting the mining system off the bottom, maneuvering the mining vessel to minimize ship motion, and riding out the storm on station. Without such accurate information, the mining operators might be more likely to leave the mining area in order to avoid adverse weather, and therefore sustain a greater loss of operational days and revenue.

4. Archival Services for Oceanographic Data

As with any other scientific discipline, oceanographic researchers and engineers utilize nearly every type of product available from the NOAA Satellite Data Services Division (SDSD) (i.e., digital tapes, photographic products, and analysis charts). Except in instances when SDSD personnel have provided additional scientific and technical assistance to its oceanographic data users, it is sometimes extremely difficult to pinpoint the exact use of the data and information by these users.

In a survey conducted by SDSD two years ago, it was estimated that nearly 50 percent of the SDSD data users were involved in oceanographic applications of satellite data and products.

Oceanographic applications (by the SDSD definition) are comprised of the following:

- o Sea Surface Temperature Studies
- o Sea and Lake Ice Analysis Studies
- o Major Current Studies (utilizing IR imagery)
- o Air-Sea Interactions
- o Internal Wave and Gravity Wave Studies
- o Ship Routing Studies

a. Data products

Satellite data products of use to oceanographic researchers can take the form of digital tapes, photographic images, and/or analysis charts. These products are primarily derived from data supplied by the NOAA polar-orbiting satellites, but also from NASA experimental polar-orbiting satellites (Seasat and Nimbus-7). These products are further broken down below:

(1) Digital Tape Data

NOAA Series Level IB Data - Contains semi-raw radiometric data with resolutions up to 1.1-km. Infrared data are used to track major ocean currents and thermal boundaries. These data support research in current motions, eddy monitoring, location of potential fisheries grounds, and ship routing. Major users of digital data are U.S. Government organizations and major universities (i.e., U. of Miami, U. of Rhode Island, Woods Hole Oceanographic Institute, and Scripps Institute of Oceanography).

SST Products - Again from the NOAA satellite series, range from actual SST observations (available globally) to weekly or monthly averages.

Northern Hemisphere Snow and Ice Charts - A single digital tape containing weekly and monthly snow and ice cover data from 1966 to the present is available. Primarily utilized by universities for long-term trend analysis.

(2) Non-NOAA Satellites

SEASAT - Various digital tape products from Seasat include: measurements of sea surface height, significant wave heights, and geoidal measurements from the Altimeter; wind speed and direction from the Microwave Radiometer; wind speed and surface temperature from the Scatterometer; and a variety of measurements for wave and wake studies from the Synthetic Aperture Radar. This relatively small data set is very popular among researchers in both the U.S. and foreign countries (i.e., Canada, Japan).

NIMBUS-7 - Data from the Coastal Zone Color Scanner (CZCS) are available for the period October 1978 to the present. Over

17,000 two-minute scenes are available in the Level I mode, and about 400 scenes in Level II. Data users are primarily U.S. universities and NOAA/NMFS.

b. Photographic Products

(1) NOAA Series

High Resolution LAC/HRPT - Infrared imagery are primarily utilized for SST applications. Available up to twice daily along U.S. coastal areas. Primarily utilized by major universities, NOAA, and the U.S. Navy.

Visible imagery are used for sea-ice applications. Daily imagery over the Alaskan Ice Shelf are supplied to both U.S. and Canadian organizations. Antarctic imagery are likewise provided when available to such organizations as the Deutches Hydrographic Institution.

Low Resolution Global Area Coverage - In fewer instances, the low resolution data are used for ice studies when LAC/HRPT data are not available.

(2) NOAA SST Imagery

Although this product exists, resolution is such that it is hardly every purchased.

(3) Non-NOAA Satellites

SEASAT - The only imaging sensor on SEASAT was the Synthetic Aperture Radar (SAR). The 25-45 meter resolution of this instrument has allowed researchers to analyze wave motions, internal waves, ship wakes, sea ice, and topographic/bathymetric effects. The short duration of the mission (99 days) has precluded any seasonal studies, and the geographic coverage (North and Central America, Western Europe, and surrounding waters) was also a limiting factor.

NIMBUS-7 CZCS - Photographic products at both levels are being used to study currents and areas of high chlorophyll content for fisheries applications. The 825-meter resolution provides an excellent tool for these studies.

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c. Analysis Charts

(1) Global SST Charts (GOSSTCOMP)

A series of 21 charts are produced weekly by NOAA covering the entire globe. A set of 6 regional charts is also available, as are monthly mean charts. Each chart provides detailed 1° Centigrade isotherms of each area. Historical charts are available upon request, as well as semi-annual or yearly subscriptions. SDSD currently provides 500 charts per week to over 76 subscribers.

(2) Oceanographic Analysis Charts

The major details of the Gulf Stream and Loop Current are produced 5 times per week (3 northern, 2 southern charts). These also are available retrospectively and on a subscription basis. SDSD currently provides 272 charts per week to over 85 subscribers.

(3) Northern Hemisphere Snow and Ice Charts

Available weekly and as monthly means. Currently over 32 charts are provided weekly to over 32 subscribers.

(4) Joint Ice Center Southern Ice Limit Charts

The Joint Ice Center produces these charts weekly and SDSD archives them. Currently no subscribers exist for this chart, but retrospective requests for historical charts are encountered.

(5) Great Lakes Ice and SST Charts

Produced weekly. Currently over 28 charts per week are supplied to over 14 subscribers.

d. Data Users

Table B-11, page B-32, summarizes the major recognized users of SDSD products for oceanographic parameters in FY82.

e. Summary

Assuming the FY82 was a representative year, there are 25 major users of satellite data for oceanographic reasons. These range from U.S. universities and Government organizations to private consultants and several foreign organizations. (See Table B-11.) Of these 25, 16 request digital data and 22 request photographic imagery. Of the total $127K recovered from these groups:

- o $75K were for digital tapes [59 percent],
- o $43K were for photos [34 percent], and
- o $ 9K were for charts [7 percent].

Of the total dollar amount of $596K recovered in FY82, major oceanographic data users accounted for over $127K [21 percent]. Other less significant ocean users could push this figure higher.

A STUDY TO EXAMINE THE MECHANISMS TO CARRY OUT THE TRANSFER OF CIVIL LAND REMOTE SENSING SYSTEMS TO THE PRIVATE SECTOR

Prepared for U.S. Department of Commerce
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A Study to Examine the Mechanisms to Carry Out the Transfer of Civil Land Remote Sensing Systems to the Private Sector

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March 28, 1983

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APPENDIX B: PRO AND CON CENSUS: AN INSTRUCTIVE PARALLEL

APPENDIX C: ILLUSTRATIVE SCENARIO - LANDSAT COVERAGE AND DEMAND

1.0 EXECUTIVE SUMMARY

This report describes the results of a three month study of commercialization options for the U.S. land remote sensing program, conducted during the first quarter of 1983. Six different options were considered, as follows:

A. Wholly Private Ownership and Operation by an Entity Competitively Selected

B. Phased-In Government/Private Ownership and Operation

C. Legislatively Chartered Privately Owned Corporation

D. Continued Ownership and Operation by the Federal Government

E. Continued Government Ownership and Operation of the Space Segment, with Commercialization of Ground Data Handling, Data Sales, and Data Distribution

F. Continued Ownership by the Federal Government, with Operations on a Competitive Full-Service Basis by a Private Corporation.

These are evaluated in terms of their ability to satisfy a set of nine stipulated objectives, relevant to issues of national importance and financial performance. The objectives are:

1. Assure Data Continuity
2. Maintain U.S. Technological Leadership
3. Promote National Security
4. Fulfill U.S. International Obligations
5. Develop the Market for Remotely Sensed Data
6. Recover Sunk Costs and Minimize Projected Cost to the Government
7. Generate Financial Returns to the Government
8. Hold Data Prices Competitive
9. Minimize Subsidy or Financial Guarantee from the Government

A methodology is defined in this report which permits the numerical comparison of all options, in terms of their ability to satisfy the stated objectives. This is done through a 3-stage process, thus:

1. Assignment of a rating for each option versus each objective, leading to the construction of a 6x9 option/objectives matrix.

2. Assignment of weights that reflect the relative importance of the given objectives.

3. Use of ratings and weights to generate a final absolute score for each option, thus permitting options to be ranked in order of preference.

This procedure was carried through in two different ways: First, using the considerable body of written material that has been developed over the past decade in prior studies and analyses to generate scores and weights. Second, through the use of interviews with knowledgeable individuals and groups active in the U.S. land remote sensing program. The results obtained from this procedure show preference for a legislatively chartered private corporation (Option C) as a vehicle should the land remote sensing program be turned over to private operation. This option achieved scores ranging from 75 to 87 out of a possible 100, using weights assigned by a number of different groups. However, it is also clear that other potential options are also candidates. In particular, Option B (phased-in private ownership) achieved scores of 69 to 84, and Option E (privately owned ground segment) had scores of 67 to 75.

It also became clear during the project that the assignment of projected weights is an important, politically sensitive, and subtle task. It is therefore recommended that sets of such weights be developed, by Congress and by the Administration, and the scores found by using these in the model should be examined.

A number of other conclusions, of possibly greater significance to the U.S. land remote sensing program than the relative numerical performance of the options, emerged from the study. They are summarized as follows:

1. No option was found that would permit the program to be commercialized, today or in the near future, without substantial subsidies or government-guaranteed data purchases. Any differences between the individual options are minor perturbations when compared with the overall large disparity between predicted cost and predicted revenues, for all options.

2. The potential revenues of the U.S. land remote sensing program are critically dependent upon the successful functioning of two spacecraft systems: sensors and telemetry. The history of the Landsat program has examples of failure of both these elements. Viewed as a commercial enterprise, today's land remote sensing system may be unacceptably vulnerable to the failure of key technological components.

3. Originally designed and evolved as a government program, the U.S. land remote sensing system lacks key components essential for a successful commercial operation. Missing elements include a product development group, sales force, advertising department, market projection group, pricing/competition evaluation group, and industry development specialists. Even with an immediate move to private operations, it would take time to establish these missing pieces, and to transform today's technology-oriented operation to a commercially-oriented enterprise.

4. Any commercial evaluation that does not tackle the central subject of the U.S. land remote sensing program as a possible public good must be considered incomplete. The present wide variety of different users suggests the appropriateness of such an idea. This point is particularly relevant, since before the end of this decade the U.S. program will be competing with earth resources satellite programs of other nations, whose programs are at least partially subsidized. This will happen in an arena where the technology is still rapidly evolving and where many of the potential markets are still undeveloped. Thus a fully commercial U.S. enterprise may not be possible for some years.

5. The recent decision on the part of the Administration to consider the commercialization of both the land remote sensing and the weather satellite systems is clearly of great national significance. However, it is unlikely that economies of scale deriving from possible combination of weather and land remote sensing programs could be sufficient to make the latter profitable in the near future. Thus, operating losses for the land remote sensing program would continue despite commercialization, even though they might be less apparent when submerged in the larger context of weather satellite operations.

9.0 OVERVIEW AND CONCLUSIONS

During the three month period of this study a number of significant events occurred that influence its outcome and recommendations. First, in the month of February the X-band antenna on Landsat-4 ceased to function. As a result, no Thematic Mapper data can be received by foreign ground receiving stations until the launch of Landsat-D'. This is probably at least two years away. Any projections for near-term program revenue derived from distribution of Thematic Mapper products by those stations are therefore now invalid. Although the financial impact of this is small, it serves to underline the technological dependencies which underpin any financial analyses of the program's future. More significant satellite failure, for example of the MSS antenna or instrument, could have immediate larger effects on sales.

Second, and more important, earlier this month (March, 1983) the Administration announced that it is viewing favorably the idea of commercializing both land remote sensing and weather satellite systems. This presents the possibility that land and weather space and ground segments could operate as a single commercial system, thereby realizing economies of scale that could improve the financial future of both. Although this suggestion had been made in 1981, by Comsat, until this time there had been no official endorsement of the concept. Now there is a definite need to recast financial projections with the idea of merged systems in mind.

Events such as these emphasize the changing realities of the U.S. land remote sensing program. Although an approach and methology was adopted in this study that permits changes to be incorporated readily into the analysis, we would point out that all conclusions of the study must be re-evaluated if there are major changes of Administration position or technological program performance.

In this context, our conclusions are as follows:

1. Based upon the analysis of available written materials, or upon interviews with parties knowledgeable of the U.S. land remote sensing program, quantitative comparisons can be made among the six optional approaches for commercialization.

2. Different groups assign widely different priorities to any commercialization program, and therefore weight objectives very differently.

3. This variation of weights notwithstanding, the final ranking of the six optional approaches to commercialization remains remarkably steady, regardless of whose set of weights are applied.

4. For all sets of weights, Option C (legislatively chartered privately owned corporation) achieves the highest score, ranging from 75 to 87 out of a possible 100. This is followed by Option B (phased-in government/private ownership and operation) with a score ranging from 69 to 84, and Option E (continued government ownership and operation of the space segment, with commercialization of ground data handling, data sales, and data distribution) with a score ranging from 67 to 75. Option D (continued ownership and operation by the Federal Government) has scores ranging from 59 to 66. The lowest scoring Options are A (wholly private ownership and operation by an entity

competitively selected) with scores from 48 to 65, and F (continued ownership by the Federal Government, with operations on a competitive full-service basis by a private corporation), with scores ranging form 42 to 61.

The definition of weights and ratings adopted in this study would give 50 as a mean score. Thus, a score in excess of 80 might normally be considered as significant. However, there are other factors, clearly implied by the data of this study, that lessen the significance of rankings of the options considered. We believe that any specific conclusions of this study must be examined within the overall context of the following general observations concerning the past and future of the U.S. land remote sensing program:

1. Almost every knowledgeable party involved in the U.S. land remote sensing program will disagree on some things, but they agree on one central thing: there is no way that this program can be commercialized, today, without considerable government subsidies or data purchase guarantees. The reasons for this are as follows:
    a. The program was originally established as experimental, and operated in that mode for over ten years. As such, it has been highly successful, demonstrating the power of a new technology and leading the world in the field. On the other hand, it was never structured to be an operational system, with guaranteed

data production at specified levels and with specified delivery timetables. Even today, the newest satellite, Landsat-4, carries completely experimental observing instruments.

b. Established as a government program with government service objectives, the U.S. land remote sensing system lacks key components that are absolutely essential to a commercial operation. These include a sales force, market projection department, advertising department, product development group, pricing evaluation group, and industry development specialists. Even if the whole program were handed over to industry tomorrow, it would take time to establish all those groups, and to transform a technology-oriented operation to a commercially-oriented one.

This does not mean that successful commercialization cannot be achieved in the long term. Most parties predict that this will eventually be the case; but there must be a substantial interim period in which the necessary missing elements are added to the system. During that period government support will be needed.

2. Since 1972, the U.S. remote sensing program has enjoyed a monopoly as a provider of data. This situation will soon change, with active programs from at least the French, Japanese, and European Space Agency. Certainly some part of those

programs will be assisted by government subsidy. Thus, by the late 1980's any commercial U.S. service may be at a competitive disadvantage on data pricing, to the point where no program can continue without government assistance.

We, therefore, recommend that Congress and the Adminstration address at once the question: Is the U.S. land remote sensing program one that contains significant components of public good and ought to be given government support for that reason?

We believe that the answer to this is clearly yes, for reasons described in Appendix B of this report. Thus, although the program can be handed over for commercial ownership and operation, and although financial support for such an operator should be minimized, this is only a part of a larger question, that of guaranteeing a continuing program. Currently, there is no such guarantee of any kind. The government program terminates with Landsat-D'.

3. For more than ten years, there have been studies of the U.S. land remote sensing program looking at its markets, economics, and technology. The results of these are embodied in numerous reports, papers, and tables (see the summary of sources contained in Appendix A). Despite this large body of information, knowledgeable parties active in the field are today unable to agree on the relative importance of even the basic objectives of a possible commercial system. In consequence, preferences for a commercialization mechanism are also a source of disagreement.

Congress, the Administration, and industry need to meet and agree on objectives. Until these are set forth, mechanisms to accomplish those objectives cannot be defined.

In carrying out this study, a number of unanswered policy questions arose. They need to be addressed and answered by the joint efforts of Congress and the Administration, before commercialization options can be fairly evaluated. They are:

- How important is a successful land remote sensing program to this country -- technologically, internationally, economically?
- More specifically, are we as a nation willing to face the possibility that this country's land remote sensing program may cease to exist, while other nations have active ongoing efforts? If we are, have the implications of that decision been explored in both Executive and Legislative Branches of government?
- Can the U.S. land remote sensing program's benefits be assigned to a fairly small group of data users, who should then logically be asked to pay for all system costs and all data? Or is there a growing and very wide set of users, similar to the users of census data, who are so numerous that service to them becomes an aspect of the public good, like national defense, public education, or environmental protection?
- Can market development of land remote sensing products reach its full commercial potential as part of a government owned and operated service?

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- If not, which is the lesser evil: to continue the program within government, recognizing that market development will be stunted? Or to move the program to the private sector, and face a possibility that without government subsidies or other guarantees it could fail completely?

These are certainly not easy questions. They remain unanswered, despite years of effort and millions of words on the subject. But they must be addressed if the future of the United States land remote sensing program is to be rationally decided.

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SPACE REMOTE SENSING AND THE PRIVATE SECTOR: AN ESSAY

Final Report under Contract No. NA-83-SAC-066
Prepared in response to the analytical requirements of the Congress of the United States requested of the Secretary of Commerce and delegated to the National Oceanic and Atmospheric Administration

National Academy of Public Administration
March, 1983

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FOREWORD

On January 5, 1983, the National Academy of Public Administration was engaged by the National Oceanic and Atmospheric Administration of the Department of Commerce to examine various alternatives for, and implications of, transfering civil operational land remote sensing satellite systems to the private sector. The National Academy in accepting this contractual obligation, included the following stipulations:

> "The approach to this project that the National Academy has adopted is to provide a highly individualized assessment, by contrast with a more deliberative and time-consuming panel inquiry, featuring not new analysis or research but hard thinking about what already has been done, learned, and recommended. To establish some sense of the context for this exercise, it may be necessary to include other aspects of this general problem that are not included in the cited Scope of Work, e.g. the weather satellites that are not mentioned in the Public Law but which receive significant attention in many of the previous studies.
>
> Identification, assessment and recommendations as to what the country should do about the truly important issues would be a major intellectual contribution of the National Academy's efforts."

The following essay responds to this charge and is intended to illuminate, with perhaps disarming simplicity, the very complex issues and relationships that surround civil remote

sensing at its present state of technical and political evolution. Because of the limited time available, the National Academy decided to proceed somewhat differently than it has on previous studies, and has relied upon a principal investigator to draft a complete report which would then be subject to searching review by National Academy members and a broad crosssection of knowledgeable outsiders (formal participants are listed in Appendix IV).

In summary, the Administration has indicated it intends to reduce to a minimum the Federal responsibilities for civil space remote sensing by transfering these to the private sector. In this general expression of intent lie implicit presumptions that the technologies involved, the data services now identified, and the utilization of remote sensing techniques for the creation of useful information have all reached a state of maturity and stability warranting a serious diminution of the Federal role. There is also a presumption that there exists a corresponding increase in private sector capabilities--and incentives--to meet all the civil remote sensing needs and demands of at least the immediate future. The Congress has asked specifically what might be the most appropriate mechanisms for effecting such a transfer from Federal to private responsibility.

A review of the economic, international, and public policy questions at play has led us to choose to comment on what appears to be the larger issue: what are the most effective means for preserving and advancing civil remote sensing in the United States as an instrument of national policy and societal progress? Recognizing the legitimate bent of the current Administration

away from continued Federal support of civil data and informational functions putatively available from the private sector, we nonetheless recommend an alternative to what is felt to be a forced premature privatization of these responsibilities. The National Academy participants have found no economic or social evidence to support a policy of immediate transfer to the private sector. On the contrary, these participants are profoundly concerned about the possibilities that the United States may be about to forgo one of its few remaining positions of civil global prestige and technological leadership. They suspect that decisions being suggested for early implementation may turn out to be irreversibly damaging to the long-term interests of the United States. They feel that there are serious public policy questions that must be addressed by Congress and the Judiciary, as well as by the Administration, before a national course of action is selected. In this time of conflict and crisis at home and abroad, there are few voices that can appropriately raise the questions of principle involved in commercialization or privatization of civil remote sensing. The participants from the National Academy, suggest the Administration and the Congress move forward in this matter with considerable caution, in consultation with the affected interests and with the results of competitive analyses in hand. All have stressed that advanced civil remote sensing research and experimentation must remain an unwavering priority of any Congress and Administration that hope to reestablish and then maintain U.S. scientific and technological leadership against the competition from beyond our borders as well as take full

advantage of progress in the creation and use of information about our planetary home. All have sought to identify the best approaches that would assure a non-monopolistic, evolving, quality service to governmental and private users falling within a policy framework responsive to net national interests. An open competitive environment, encouraging early private enterprise roles in value-added analytical services and provision of specialized data to selected customers, seems most conducive to successful continuity and expansion of the promising civil remote sensing program. On balance, the National Academy participants believe it is far too early for the Federal government to abandon its present pattern of research, service, and operation. If a change is nevertheless dictated by other considerations, we would hope to see the Congress take note of the conclusions of this essay in search for the most appropriate legislative initiative that will guarantee the wise development of civil remote sensing in the United States in support of all the nation's values, domestic as well as international.

J. Jackson Walter
President
National Academy of Public Administration
March, 1983

INTRODUCTION

Title II of Public Law 97-324, dated October 15, 1982, directed the Secretary of Commerce to "plan for the transfer of the ownership and operation of civil operational land remote sensing satellite systems by the private sector when in the national interest" (emphases added). The Secretary was further directed to conduct or have conducted a number of specific studies, among which fell the following:

> "Compare various feasible financial and organizational approaches for such a transfer. Criteria for the comparison should include considerations such as: maintenance of data continuity; maintenance of United States leadership; national security; international obligations; potential for market growth; marketing ability; sunk and projected cost to the Government; independence of subsidy or financial guarantee from the Government; potential of financial return to the Government; and price of data to users. The following institutional alternatives should be compared: (i) wholly private ownership and operation of the system by an entity competitively selected; (ii) phased-in Government/private ownership and operation; (iii) a legislatively chartered privately owned corporation; and (iv) continued ownership and operation by the Federal Government." (The full text of the legislation is included as Appendix I.)

To a first order, it might seem relatively straightforward to develop and expand a matrix of the ten "considerations" and

the four "institutional alternatives" specified in the legislation together with some kind of weighted values at the intersections which, when totaled, would provide an evaluation of the "best mechanism" for this particular transfer of ownership and responsibility from the Federal to the private sector. It is important to note that the Congressional language is not specific as to the structure of national or program priorities and objectives against which it wishes to test the notion of a "best" mechanism; it is clear that any one of the different mechanisms is likely to lead to some qualitatively and quantitatively different long-term future. In the same vein, the ten considerations are not of equal importance nor do they even all relate directly to the matter of mechanism selection. And finally, the legislation specifies transfer of operational land sensing satellites at a time when there are no commitments to, or plans for, such operational systems.

It therefore seems that a less constrained approach might help illuminate some of the important issues that involve the interests of all three branches of government in considering the present and future place on the national and international scene of civil remote sensing from space. First, it seems necessary to discuss the operational land remote sensing questions within a perspective that includes all other space remote sensing activities. Second, it seems appropriate to examine the evolution of policy and proposals that has proceeded since the drafting of the original Congressional charge last summer.

It is believed, therefore, that the choice of a wider study

horizon beyond just that indicated by "land remote sensing" will provide for better understanding of the public policy issues that the Administration and the Congress will have under advisement during this coming year.

There is no intention of repeating any of the many completed studies and assessments that will be brought to bear in support of various sides of the questions yet to be resolved, nor of pursuing here reputedly quantitative studies of the cost-benefit type; a selective bibliography covering a range of such studies is included in Appendix III. The policy problems call more for informed judgment and long-range thinking than for attempts at some mathematical precision within imprecise models.

CONCLUSIONS

The picture of an integrated , well-organized, interactive system of space and ground elements able to provide user access to a wide variety of repetitive global data, in combinations and sets as desired, is a most attractive one. There is a further attraction to assuring that all legitimate users are well-served rather than just those at the highest end of the ability-to-pay spectrum. Today, this integration and technical service development appears far more easily managed by Federal professionals within the permanent institutions of NOAA, NASA, and the many involved user and policy departments than elsewhere.

First, government is a principal data consumer and the shortest link between supplier and customer is the most efficient. Second, the various civil remote sensing capabilities are at wildly different stages of maturity. This applies both to the initial sensor/data acquisition phases and to the eventual data manipulation/information extraction phases of the cycle; to bring these harmoniously together and forward over time requires longer horizons than typically control commercial investment and return- on-investment policies. Third, there are no currently accepted economic rationales for wholesale privatization at this time. Fourth, an aggressive continuing Federal R&D effort looking at the civil remote sensing values and opportunities beyond the current generation-plus-one of capabilities is clearly needed for internal progress and for maintaining a U.S. leadership position in civil space applications. Ideally, taxpayer-funded R&D should serve the broadest range of users and uses (i.e., the entire

Federal constituency) and is difficult to justify when focused on a single company or even industry. Fifth, the Federal government can encourage the private sector exploration of the existing data flow from space ("value-added" analysis and interpretation services for those customers choosing not to do this work in-house) and in filling in the inevitable "windows" or gaps that occur in the data service itself (flying specialized instruments designed to produce optimum results for particular high-value functions). A natural competitive expansion of private sector responsibilities can best occur in a non-monopolistic environment with benign case-by-case licensing and regulation, moving at a pace governed by market forces. One early example of regulation may be the assurance of copyright-like protection for privately acquired data directly coupled to a policy of open market availability thereof. "Value -added" information products can continue to be treated under conventional rules governing the publication of materials for sale and the privacy of proprietary information.

This combination of Federal R&D, Federal system operation in the national interest, and gradual shift of responsibilities as private sector confidence and markets grow is probably the surest guarantee of continuity of service, U.S. leadership, and retained control over all major policy elements from cost recovery to national security.

The basic conclusion of this study, then, is that the proposal to transfer civil land and weather remote sensing responsibilities to the private sector fails to meet sensible

criteria of preservation of the national security, the existence of competition among mature operational technologies as well as commercial institutions, and the appropriate relationship between the public and the private interest. In terms of the legislative questions, therefore, the weight of evidence supports a permanent Federal role in advanced R&D and in assuring data service continuity and the gradual phasing in of commercial enterprises into management and ownership roles as technologies stabilize and real markets mature.

From actions taken to date, it does not seem that the Administration is prepared to retain management control of civil remote sensing even in the face of the high policy and financial costs involved. The transfer from Federal to other hands of physical property and program responsibilities of the magnitude envisaged here will require Congressional authorization at the very least. If the Congress is presented with a privatization proposal it deems inappropriate, it can reject that proposal; rejection alone, however, does not automatically guide the Administration toward another option. The danger here is that a Congressional rejection without some viable alternative being pressed forward will result in programmatic and political stasis. In such a situation, programs may deteriorate and momentum may diminish to a point beyond rescue.

The Congress has the opportunity and responsibility of acting on the matter of civil remote sensing. It is a conclusion of this study that, in so acting, the Congress should be particularly sensitive to:

- The growing and diverse needs of the user communities

and the importance of assuring, as a matter of national policy, continuity of data services.

- The interlocking national security questions of foreign competition and cooperation, U.S. technological preeminence supported by strong research and development, and protection of U.S. interests from hostile interference or exploitation.
- The importance of private sector involvement in remote sensing under acceptable conditions of competition, investment, and profitability.
- The need to assure that service continuitity, U.S. leadership, and international security interests are provided for fairly and economically in terms of taxpayer costs and returns.

As noted earlier, Federal retention of overall responsibility responding to competitive commercialization initiatives as they occur appears the soundest approach. To seek out a single private entity to own and to operate all civil U.S. remote sensing systems would create an effective monopoly potentially dangerous to technical progress and to the economic and social interests of the users, besides appearing at this stage to require considerable financial subsidy and protection to succeed. A new government enterprise, designed as a mixed public-private enterprise in order to assure the earliest infusion of private investment and interest, could be chartered by the Congress to carry out and expand the current Federal civil remote sensing functions. If the Congress and Administration

pursue this route, it would require careful drafting to assure that the dangers and costs associated with the other alternatives are not compounded. Detailed definition of such a new entity is beyond the scope of this study, but it seems that under such an approach many of the positive aspects of private involvement--especially incentives to expand markets, improve services, and reduce costs--could be encouraged without incurring policy problems of monopoly, subsidy, international concern, and national security erosion. If such a mechanism is selected, a simple organic act drafted in directive rather than permissive terms would be called for; Federal investment could be in the form of a single initial infusion of physical and financial capital (on the order of a revolving fund); added capital could come from shares sold on the open market; charter language could regulate the most important parameters of service, price, and data ownership; and appropriate "sunset" language could protect against perpetuation of such an enterprise when conditions change and circumstances offer a superior approach.

Management of the expanding complex of related remote sensing technologies and systems to benefit the greatest range of U.S. interests at the lowest cost to the society poses very difficult problems and choices. There is no single "best" approach that will appease all constituencies. Above all, there is a danger of irreversible damage to the national interest if improper management solutions are impressed upon programs of such high policy importance.

APPENDIX II

SUMMARY CHRONOLOGY OF COMMERCIALIZATION POLICY PROCESS

July 1972	Landsat 1 is launched
January 1975	Landsat 2 is launched
Late 1970's	General congressional accord on the issue of establishing a continous civil land remote system. Disagreement over the institutional features prevents action.
May 1977	The White House through the Office of Science and Technology Policy (OSTP), states that an operational earth remote satellite system is premature and requires further study.
March 1978	Landsat 3 is launched
May 1978	The White House announces that the United States will encourage domestic commercial exploitation of space capabilities (PD - 37).
October 1978	The White House calls for further study of the operational land remote sensing issue and makes a commitment for continuity of service (PD 42).
1977-April '79	Several bills are introduced in Congress on general space policy and the specific issue of an oper-ational remote sensing system. In the subsequent Senate hearings, Administration witnesses testify that data continuity is important, but an operational system is still premature.
November 1979	Based on studies conducted by the Policy Review Committee on Space, the White House announces Presidential Directive 54 which establishes the following:

-- NOAA would have responsibility for all civil operational remote sensing spacecraft systems, satellites, and associated ground systems.

-- There would be an Administration commitment to continuing civil land remote sensing through the 1980's.

-- The management of civilian and military programs would remain distinct except in cases where both would benefit by joint operations.

June 1980 — NOAA issues report "Planning for a Civil Operational Land Remote Sensing Satellite System: A Discussion of Issues & Options."

1980 — In its revision of the FY 1981 budget, the Administration deletes funding for proposed satellites beyond Landsats D and D'.

Early 1981 — The Administration agrees to consider the transfer of weather satellites in response to an inquiry by a private firm.

The Cabinet Council on Commerce and Trade (CCCT) is charged with considering the issue of transfering the land remote sensing system to the private sector, specifically addressing two questions:

-- What is the best mechanism to implement the current policy of transfer of civil land remote sensing systems (Landsat) to the private sector as soon as possible?

-- Should the Administration consider simultaneously private sector transfer of both civil weather and land remote sensing systems?

July 1981 — A memo to the White House from the OMB notes that the Administration had withdrawn the Carter commitment to data continuity through the 80's, and that additional satellites beyond Landsat D and D' would depend upon the private sector for investment and operation.

December 1981 — COMSAT delivers an unsolicited proposal known as the Earthstar document to the government.

March 1982 — COMSAT updates the Earthstar document. Two additional unsolicited proposals from private firms are received by the government.

April 1982 — Congress releases a report dated 12/81 based on earlier hearings during which COMSAT requested it be made the "designated entity" for operating land and weather sensing systems.

June 1982 — The Land Remote Sensing Satellite Advisory Committee (LRSSAC), consisting only of private sector members and chaired by Michel Halbouty meets and considers for the first time the possibility of transfering weather sensing systems. It suggests that the ideas of transfer be

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tested by asking for private industry positions.

July 1982 Landsat 4 is launched

July 1982 The Administration announces its Space Policy, and defines the role of the Commerce Department as manager of the remote sensing system. It also states that the government should create an environment favorable to increase private sector space activities.

The Senate entertains a bill designed to promote the transfer of Landsat to the private sector.

September 1982 The Department of Commerce issues a Request for Information (RFI) in Commerce Business Daily on private industry views on the two questions under consideration by the CCCT.

October 1982 The FY 83 NASA authorization bill PL 97 - 324 becomes law and gives NOAA responsibility for managing and operating civil land remote sensing systems.

Fifteen responses to the RFI are received. They are summarized as follows:

American Science and Technology Corp. (ASTECH Corp.)

Plans to launch their own series of low cost Multi-Spectral Scanner (MSS) remote sensing satellites. Their proposal consists of assuming command and control of Landsats D and D', post-launch and orbit, and integrating them into their system. The proposal indicates they will not process the data, just provide it. The proposal does not express an interest in the transfer of the weather system to the private sector.

Autometric, Inc.

Proposes a comparison of geologic imagery from the Landsat Thematic Mapper (TM), the French Spot and the Large Format Camera so as to help determine the competitiveness of the Landsat/TM and to aid in pricing TM products. Commerercialization is not discussed in this response.

Computer Science Corp.

Response does not make a submission on the commercialization issue, but desires to be included in future discussions.

COMSAT Corp.

Response repeats earlier interest in obtaining both the weather and land remote sensing systems. Conditions for initiating negotiations include:

--A commitment by the government to purchase a specific amount of data for the first fifteen years.

--Assurance by the government of the economic viability of the system during the early years.

--Gradual assumption by the commercial operator of the financial risk.

--Best efforts basis by system owner/operator.

--Protection of property rights in data.

Control Data Corp.

Proposes the establishment of a private Landsat User Service Center, combined with continued government control of satellites to help support the full transition to the private sector. The proposal indicates that weather data might eventually be included in this system. The proposal questions whether there is a sufficient user market to support a private venture.

Environmental Satellite Data Inc.

Proposal suggests commercialization of the two subsets within the weather satellite system. It does not discuss commercialization of the entire weather system or of Landsat.

General Electric Co.

Response concludes the government should continue the operation of Landsat with possible eventual private sector involvement. The response does not discuss the weather systems.

Dr. Robert Georgeric

A university professor, who states his opposition to commercialization in general on a postcard.

Hughes Aircraft Co.

The Hughes response supported government ownership of land and weather sensing systems for at least another ten years, since it can find no valid impetus for the private sector assuming the task

of remote sensing and doubts great market growth.It does suggest guidelines if the government proceeds with commercialization. These include: considering Landsat, TIROS and GOES separately; selecting contractor through a competive process and not granting a monopoly.

Ocean Routes, Inc.

Response indicates that the government should continue to operate the weather systems so as not to create a monopoly situation. It takes no position on Landsat commercialization.

RCA

Response generally opposes commercialization of Metsats, but states that Landsat appears to be a viable candidate for commercialization. The response also says that some form of leasing is the only near-term practical possibility for either land or weather remote sensing systems.

Space Service, Inc. (SSI)

Response demonstrates no intention of purchasing or operating Landsat systems, and is concerned that commercialization does not adversely affect private endeavors. The response indicates that weather satellites should not be commercialized.

Terra-Mar

Response suggested eventually moving remote sensing facilities to the private sector, but that currently a company does not exist that could operate remote sensing in an open market. The response opposes commercialization of weather satellites.

University of Massachusetts (UMASS)

Proposes gradual commercialization of land and weather satellites done in three phases: establishing a network of User Interface Facilities, development of low cost privately owned sensors, eventual full data acquisition of user Interface Facilities.

November 1982 The Federal review panels established to evaluate the RFI responses publish their reports. They note the strengths and weaknesses of each proposal and stress the potential problems of monopoly and subsidy.

November 1982 The LRSSAC and its working groups publish their findings and recommendations. Among the unanimous recommendations of the LRSSAC are that:

--the Administration transfer land and/or weather sensing systems to the private sector

--the Administration make a commitment for continuing R&D in both weather and land systems.

Dec.'82-Jan'83 The CCCT considers the land and weather systems and submits suggestions to the White House.

March 1983 NOAA announces the Administration's decision to transfer the nation's civil operational remote sensing satellites, including both Landsat and the weather satellites, to the private sector.

APPENDIX IV

PARTICIPANTS IN THE NATIONAL ACADEMY OF PUBLIC ADMINISTRATION POSITION DEVELOPMENT AND REVIEW PROCESS

1. Members of the National Academy's Formal Discussion Review Group

   Philip H. Abelson
   Philip M. Burgess
   William D. Carey
   Paul G. Dembling
   Harold B. Finger
   Gilbert Gude
   Matthew Holden
   Elmer B. Staats
   J. Jackson Walter

2. Members of the National Academy's Formal Reader Review Group

   Bruno Augenstein
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COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

January 6, 1984

MEMORANDUM

TO: MEMBERS, Subcommittees on Space Science and Applications, and Natural Resources, Agriculture Research and Environment

FROM: HAROLD L. VOLKMER

SUBJECT: Attached NOAA Report

During our hearings this summer on the subject of commercialization of civil remote sensing satellites, several Members requested that NOAA prepare a report discussing the possibility of an international meteorological satellite system.

NOAA has prepared a report entitled, "International Meteorological Satellite System: Issues and Options", in response to our request. On Page vii, the following sentences appear:

> "The report concludes that the present arrangement, i.e., nationally operated systems, exposes data users to the possibility of unilateral termination of service. On the other hand, a formal international organization is not a feasible alternative in the immediate future. Instead, the most practicable route to take is one of enhanced coordination among satellite operators today, with a long range view toward the evaluation of a more formal mechanism."

This report is attached for your information.

HLV/Bld
Attachment

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Washington, D.C. 20230

THE ADMINISTRATOR

NOV 22 1983

Honorable Harold L. Volkmer
Chairman, Subcommittee on
Space Science and Applications
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

In your letter of August 4, 1983, you requested that NOAA prepare a report concerning possible international operation of a global meteorological satellite system. As requested, enclosed for your review is a report prepared by my staff entitled "International Meteorological Satellite System: Issues and Options." This report describes four potential international arrangements that could enhance long-term continuity of satellite data and increase international financial and technical support for the current national systems. The possible mechanisms range from very formal organizations to enhanced informal technical coordination among satellite operators.

If you have any questions or comments regarding this report, please contact Dr. John H. McElroy, Assistant Administrator for Environmental Satellite, Data, and Information Services, at 377-1141.

Sincerely yours,

John V. Byrne

Enclosure

INTERNATIONAL METEOROLOGICAL SATELLITE SYSTEM: ISSUES AND OPTIONS

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL ENVIRONMENTAL SATELLITE,
DATA, AND INFORMATION SERVICE

NOVEMBER 18, 1983

INTERNATIONAL METEOROLOGICAL SATELLITE SYSTEM: ISSUES AND OPTIONS

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Overview

For nearly 25 years, satellite data have played an important role in monitoring the Earth's environment. Today, satellite derived meteorological data play a vital role for all nations in predicting severe climatic events such as hurricanes, floods, typhoons, and tornadoes. The capability to monitor these events has minimized significantly the loss of life and property. In many cases the impact of meteorological events is local; however, the accurate monitoring of weather patterns requires regional as well as global observations. The vantage point of space allows such an observing capability on a continuous basis.

Today, a handful of countries operate meteorological satellite systems to meet national as well as international requirements. To some degree, international cooperation among these nations and non-satellite operating countries has reduced the financial burden of maintaining these systems for operating nations. Constrained national budgets, however, have cast a shadow over the future of some programs that provide important data to users worldwide. It is clear that some nations are unwilling and/or unable to shoulder the burden alone. The purpose of this report is to examine mechanisms to ensure the long-term continuity of meteorological satellite data and to share more equitably costs of such continuity through international cooperation.

Four models are discussed based on existing international mechanisms. These are the International Telecommunications Satellite Organization (INTELSAT), the Coordination on Geostationary Meteorological Satellites (CGMS), the World Meteorological Organization (WMO), and the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT). Each model is evaluated on the basis of a number of concerns. For example, the report addresses national security, technology transfer, the role of the non-satellite

operating country, the role of private sector operators, continued research and development, national contributions, and the feasibility of implementation. The report concludes that the present arrangement, i.e., nationally-operated systems, exposes data users to the possibility of unilateral termination of service. On the other hand, a formal international organization is not a feasible alternative in the immediate future. Instead, the most practicable route to take is one of enhanced coordination among satellite operators today, with a long range view toward the evolution of a more formal mechanism.

I. INTRODUCTION

Weather is a global phenomenon that respects no national boundaries. Over the past century, prompt weather monitoring and forecasting have produced increasing contributions to the safety of the citizens of this and other countries. The ability to predict and monitor environmental phenomena has minimized significantly the loss of life and property worldwide. Though the impact of severe meteorological events is, in many cases, local, the accurate prediction and monitoring of weather patterns requires regional as well as global observations. Measurements in one country are fundamental to understanding atmospheric events in another. As forecasting requirements increase, and forecasting methods become more sophisticated, measurements must be made farther and farther from national boundaries in order to extend the forecast period. Further, increasing global interests of many countries also demand extraterritorial measurements over larger and larger areas. These considerations have fostered a 100-year tradition of a voluntary free international exchange of meteorological data.

The rapid improvement of forecasting capabilities has, to a great extent, depended on the availability of information developed from meteorological observations acquired over accessible as well as inaccessible regions of the Earth. For the past twenty years, meteorological data collected by satellites have enhanced the existing surface and radiosonde observation systems.

The vantage point of space allows monitoring of the Earth's environment on a continuous basis to provide data vital to efficient meteorological services. Recognizing the value of observations from space,

the European Space Agency (ESA), India, Japan, the USSR and the United States have developed and launched spacecraft which today provide a global satellite monitoring system.

National meteorological remote sensing satellites have proven to be essential to the development of modern weather prediction techniques. In this regard, all satellite operators have worked together to maximize the potential usefulness of satellites through the coordination of technical parameters and the exchange of data. The first step in this process was the establishment in the 1960's, by the World Meteorological Organization (WMO), of the World Weather Watch (WWW). Under the WWW, a series of world centers and regional centers was established for aggregating satellite and conventional weather data, integrating the two, and disseminating the resulting analyses and forecasts to the WMO Member States. During the same period, the WMO and the International Council of Scientific Unions (ICSU) began to develop a joint program for atmospheric research called the Global Atmospheric Research Program (GARP). GARP represented large-scale environmental data collection projects requiring extensive international cooperation. In particular, significant quantities of meteorological satellite data were required, especially over oceans, polar-regions and other remote areas where conventional data were lacking.

The primary project under GARP was the First GARP Global Experiment (FGGE), conducted in 1978-1979. Close coordination among nations was undertaken to implement FGGE successfully. Much attention was given to developing the required weather satellite coverage.

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To maximize the support for FGGE, representatives from the European Space Research Organization (ESRO) [now the European Space Agency (ESA)], Japan, and the United States--all current operators of geostationary meteorological satellites--initiated in 1972 an informal technical committee known as the Coordination on Geostationary Meteorological Satellites (CGMS). In subsequent meetings during the 1970's, India, the USSR, and the WMO joined the discussions. The CGMS coordinated the technical characteristics and operational procedures of current and planned geostationary weather satellites so as to enhance support to the FGGE.

The CGMS, the FGGE experiment and the WWW are just some of the many examples of informal international coordination in the area of meteorological remote sensing from space. Compatibility among national systems is obviously an important activity, but there is also formal international cooperation in meteorological satellite remote sensing. For example, France and the United Kingdom provide, on a bilateral basis, instruments developed at their own cost for the U.S. polar-orbiting meteorological satellite series known as NOAA. Over the years, these instrument contributions have produced significant cost savings for the United States and provided valuable environmental data to the world community.

In addition to formal bilateral cooperation, some nations have developed formal multilateral mechanisms to provide meteorological satellite data. In May 1983, twelve European countries signed a convention

establishing the ratification process for the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT). EUMETSAT will manage Europe's operational meteorological satellites and provide continuity of satellite data to its member states. As a first step, ESA established a pre-operational geostationary meteorological satellite program---METEOSAT. EUMETSAT represents the first formal international organization established solely for the purpose of maintaining on a long-term basis meteorological satellite data services.

The preceding discussion has served to illustrate briefly the essential role satellite data play in global weather programs. It is also clear that international cooperation is important in providing essential weather services, in general, and the efficient management of meteorological satellite programs, in particular. Over the past years, cooperation for the most part has taken the form of informal mechanisms to meet specific needs. It is becoming more apparent, however, that continued and even enhanced international cooperation will be essential in meeting the global requirements for long-term operational satellite data. EUMETSAT represents one such approach, albeit, a regional one.

As satellite data are becoming more and more a part of operational weather monitoring and forecasting, concern has increased as to the reliability and continued operation of national meteorological satellites systems. Constrained national budgets and the vagaries of the political process have cast a shadow over the future of some national programs that provide important data to users worldwide. It is apparent that individual nations are not willing to shoulder alone the burden of maintaining global

satellite observation systems. Recognizing this eventuality, the European countries have agreed to pool their resources in the form of EUMETSAT in order to ensure some continuity of data over that region of the world.

In the United States, the Administration has proposed to reduce the current NOAA polar-orbiting satellite system from two satellites to one. This reduced system would meet the core of U.S. weather forecasting requirements with added risk of loss of data continuity, but it reduces significantly support to other countries and to the global monitoring activities of the United States. For this reason, the United States proposed to representatives at the 1983 Summit of Industrialized Nations (Canada, France, the Federal Republic of Germany, Italy, Japan, the United Kingdom, and the European Community) that they join in the study of an internationally-sponsored polar-orbiting weather satellite to complement the existing system. The Summit Nations supported this concept in principle and agreed that further discussions should continue within the Summit framework.

The issue of continued access to meteorological satellite data for nations that do not operate their own space systems was a topic of discussion at the 1982 Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE '82). The final report of that conference stressed the need for all countries to have free and continuous access to satellite data. To this end, the Conference recommended to the WMO that it undertake "a study concerning the possibility of setting up an international structure providing continuous availability of and access to satellite meteorological data." The WMO has prepared a document entitled, "Considerations for Future International Cooperation in a Global

Meteorological Satellite System," ((CGMS)-XII WMO-WPI) in which various issues regarding cooperative schemes for providing operational satellite data are examined. Among some of the more important considerations identified in the paper are the following:

- Achieve maximum assurance of continuity in spatial and temporal coverage,
- Achieve the highest degree of compatibility among different satellite systems,
- Provide an adequate system for the minimum cost on an average annual basis,
- Provide for equitable cost distribution among users,
- Stimulate technological growth in developed and developing countries,
- Maximize the utility of the output to all users.

The concept of substantial formal international cooperation is not new in the area of space technology. In the field of satellite communications, economies of scale are enjoyed by the countries of the world through organizations such as the International Telecommunications Satellite Organization (INTELSAT), the International Maritime Satellite Organization (INMARSAT), and the European Telecommunications Satellite Organization (EUTELSAT). Such organizations provide continuous low-cost telecommunications services worldwide in a manner more efficient and economical than if such activities were left up to a multitude of

individual national systems. These serve as possible models for enhanced international cooperation in meteorological satellite remote sensing.

The preceding discussions have served to demonstrate that the global demand for satellite data is becoming more acute, and it may be beyond the willingness of any one nation to supply. Countries are becoming more and more dependent on the continuous free exchange of meteorological satellite data from individual national systems, but without assurances that satellite operating countries will continue their respective programs, many countries will be hesitant to make any significant investment in expertise and hardware necessary for utilizing a very important source of data. For the satellite operator, international cooperation could alleviate the budgetary pressures now being felt by all countries. International cooperative frameworks also provide an opportunity for a country to have a voice in management of the course the system will take.

The United States is not alone in its ability to develop and operate meteorological satellites. Today, ESA, Japan, and India have operated geostationary meteorological satellites with capabilities similar to those of the U.S. GOES system. The international technological capabilities which exist today could be coordinated further with the intent of taking full advantage of the possible economies of scale. Thus, in principle, continued satellite services could be provided while easing the strain on national budgets and with enhanced system capabilities. The purpose of the following chapters will be to examine further mechanisms for improving global meteorological

services through international cooperation. Current international activities and capabilities will be described as well as other possible cooperative models ranging from informal coordination to the creation of new specific organizations. Each scenario will be evaluated to determine its potential for providing meteorological satellite data on a continuous basis in a cost-effective manner. Further, this evaluation will rely to a large extent on the activities of existing international organizations such as the WMO, INTELSAT, and EUMETSAT and their relevance as potential models for meteorological satellite remote sensing.

II. CURRENT AND FUTURE CIVIL METEOROLOGICAL SATELLITE CAPABILITIES

In examining institutional arrangements for providing long-term data continuity, it is important to remember that any future global system must, at a minimum, provide the current level of data products and services and provide for future improvements. The U.S. system acquires data that are vital to its ongoing meteorological programs. As well, most nations of the world depend heavily on the current capabilities of both U.S. and other national systems. These systems provide direct readout free of charge to national and foreign stations and contribute data to the WMO's Global Telecommunications System (GTS). The technical parameters of any new international system should meet these current and projected new data requirements. Additionally, the international exchange of data free of charge should continue through present mechanisms, such as the GTS, as well as any future arrangements.

With this in mind, the following section will outline the current international civil meteorological satellite capabilities and currently projected future technological developments, such as U.S. plans for the GOES-NEXT and NOAA-NEXT series. For the purpose of this paper, it is assumed that any multilateral international satellite organization would incorporate as a baseline the current technological capabilities as well as any firm plans for enhanced systems. Such a system would also be defined to meet at least the minimum global climate monitoring and forecasting requirements.

A. CURRENT CIVIL SATELLITE PROGRAMS

1. Geostationary Meteorological Satellites

Though there are four geostationary (ESA, India, Japan, and the United States) and two polar-orbiting (United States and USSR)

meteorological satellite systems today, the instrument technology is on the whole quite similar. The USSR has stated its intention to launch a geostationary system within the next several years. All employ the use of passive visible and infrared sensors and data collection and dissemination systems. The polar-orbiting satellites provide daily global coverage, while the contingent of geostationary spacecraft observe continuously on a regional basis the growth and movement of severe weather events. Taken together, the individual national systems represent a global observation system.

In general, the current geostationary satellites share the following capabilities:

- Routine observations (visible and infrared imagery) every 30 minutes to three hours,
- Imagery in the visible and infrared ranges of the spectrum,
- Spatial resolution ranging from 1 km to 2.5 km in the visible and 5 km to 8 km in the infrared spectral range,
- Data Collection System (DCS) capability for receiving and retransmitting environmental information from remote ground platforms,
- Direct broadcast of digital and analog data to ground stations free of charge.

The national systems also have unique capabilities. For example, the primary sensor on ESA's METEOSAT spacecraft can acquire data in the water vapor absorption band, while

the U.S. GOES satellite incorporates an experimental capability to determine vertical atmospheric temperature soundings. The similarities and differences among these spacecraft must be taken into account when considering the level of technology employed in any future global system.

For the purpose of this portion of the discussion, the current technical parameters of the existing geostationary satellites will be outlined in general as well as some of the specific products and services of the U.S. GOES system, in particular. It should be noted that U.S. contractors built the Indian, Japanese, and U.S. spacecraft. The ESA system is similar to current U.S. technology.

a. Geostationary Operational Environmental Satellite (GOES)

The GOES system is comprised of two spacecraft, in geostationary orbit located over the Equator at 135°W and 75°W longitude. The principal sensing instruments on the GOES satellites are the Visible Infrared Spin-Scan Radiometer (VISSR) Atmospheric Sounder (VAS), and the Space Environment Monitor (SEM). Major communication capabilities include the GOES Data Collection System (DCS), direct transmission of VISSR data, and the WEFAX (Weather Facsimile) service. The first prototype of the GOES satellite, the Synchronous Meteorological Satellite (SMS-1), was launched in May 1974.

Visible Infrared Spin-Scan Radiometer (VISSR) Atmospheric Sounder (VAS). VAS is the principal instrument carried on the geostationary satellites. The VAS has both imaging and sounding capabilities. It provides near-continuous cloud viewing (images) with resolution of 1, 2, 4, and 8 km in the visible wavelengths and 8 km to 14 km in the infrared wavelengths. The VAS has 12 infrared channels whose data are used to derive vertical temperature and moisture profiles (soundings) over selected areas; this is a capability not present in other geostationary systems.

Generally, VAS imagery products include: full earth disk images of cloud patterns in the visible and infrared every 30 minutes throughout the day and night; or partial disk images (sectors) at more frequent intervals (up to every five minutes) as required to view the development and movement of severe storms. Full disk images in the water vapor portion of this spectrum are now provided four times a day. As well, the VAS can scan for data to be used for atmospheric soundings. Imaging and sounding are not possible simultaneously, since soundings now require repeated scans of the same surface area to build up signal levels suitable for sounding.

The following are examples of some of the products derived from data acquired by the VAS instrument:

o Cloud Top Heights - The infrared imagery provides the temperature of cloud tops. These cloud top temperatures are

combined with radiosonde data and conventional temperature analyses to assign the height of the top of the clouds using an interactive computer.

- Sea Surface Thermal Patterns - By saving the warmest values of infrared brightness temperatures over a series of consecutive images, the thermal patterns of the sea surface are preserved. The major ocean thermal features revealed are the Gulf Stream and its major meanders and eddies, the structure of the Gulf of Mexico Loop Current, and changing flow patterns in equatorial ocean currents.
- Quantitative Precipitation Estimates - A combination of manual interpretation and interactive computer enhancement of both the visible and the infrared imagery is used to estimate the amount of precipitation coming from convective storm systems and hurricanes.
- Hurricane Classification - A semi-objective method of classifying the stage of development and the maximum winds of tropical storms from incipience through hurricane intensity, uses infrared and visible images. The location and present track of tropical storms are also derived from the imagery.
- Sea fogs are detected from sequential ocean image analyses, with sea surface temperature applied as a key decision factor.

- o The Earth's energy balance is calculated, by regions, with solar input reduced by infrared (heat radiation) losses to space. The results are useful in climate studies, and to assess the impact on short-term weather of such events as volcano explosions.
- o Paths through ice, for Alaska and the Great Lakes, are plotted for oil tankers and other shipping vessels using GOES images and an ice-analysis program.

Space Environment Monitor. The GOES Space Environment Monitor (SEM) consists of three major components: a magnetometer which measures the magnetic field at spacecraft altitude; a solar x-ray sensor which provides data on solar x-ray activity to monitor and predict solar flares; and the Energetic Particle Sensor and High Energy Proton and Alpha Detector designed to measure energetic particle flux at orbital altitude.

X-ray data, monitored in real time from SEM sensors, can disclose the onset of a solar flare that may seriously affect telephone, teletype and radio communications. High energy particles may damage solar cells, cause sensor malfunctions, or, in today's world of ever-smaller digital microcircuits, may trigger bad data or spurious housekeeping commands aboard a spacecraft.

Data Collection System (DCS). GOES DCS is a communications relay system that uses the transponder carried on the GOES spacecraft to relay UHF transmissions from data collection platforms (DCPs) by S-Band to properly equipped ground stations. Conversely, S-Band transmissions from the NOAA ground system can be relayed through the transponder in UHF to properly equipped DCPs. The two operational GOES have radio view coverage of most of the Earth from 0° westward to 170°E longitude. Poleward coverage is limited to about 70°N or S latitude. Each spacecraft is capable of supporting up to 233 data relay channels. Theoretical capacity is in excess of 12,000 DCPs reporting on the average 11 times per day. DCS products are in-situ measurements made by data collection platforms located in remote areas. All data relayed via the DCS provide information about the environment.

Examples of the utilization of the DCS include:

- o Hydrology - river stages and flood forecasting,
- o Data buoys - both near shore and deep ocean for operational and research purposes,
- o Hurricane reconnaissance - automated and manual reports from "hurricane hunter" aircraft,
- o Research - "STREX" (Storms Transfer and Response Experiment), ocean monitoring on ships of opportunity (Ships are instrumented with weather and oceanographic sensors),

- Other - mesoscale model verification of wind fields over the Pacific Ocean and tsunami warnings.

WEFAX (Weather Facsimile) Service. WEFAX provides S-band broadcasts of processed satellite images. U.S. National Weather Service meteorological charts and alphanumeric products are sent at scheduled times via the GOES satellites. As well, unmapped GOES images and mapped images from polar-orbiting satellites make up the bulk of WEFAX transmissions. All WEFAX data are transmitted from the NOAA Command and Data Acquisition (CDA) station in Virginia. In the Western Hemisphere, WEFAX broadcasts are acquired at approximately 160 locations.

b. European Space Agency (ESA) METEOSAT

The METEOSAT system consists of a spacecraft located in geostationary orbit at 0° longitude and the control center at Darmstadt. The METEOSAT spacecraft's payload is comprised of a visible and infrared scanning radiometer (which includes a water vapor channel), a Data Collection System, and a weather facsimile service (WEFAX). METEOSAT-1 was launched in November 1977 and METEOSAT-2 in June 1981.

- Visible and Infrared Scanning Radiometer - The principal scanning instrument provides near-continuous viewing in the visible and near-infrared bands at 2.5 km resolution, the thermal infrared wavelengths at 5.0 km resolution,

and in the water vapor bands at 5.0 km resolution.

- o Data Collection System - This communications system relays environmental data transmitted from ground collection platforms in formats similar to the DCS of GOES.
- o WEFAX - METEOSAT and GOES imagery are provided in analog form as well as cloud-top height analyses and selected weather charts.

c. Japanese Geostationary Meteorological Satellite (GMS)

The GMS satellite is located in geostationary orbit at 140°E longitude. Its primary instruments include a visible and infrared radiometer, a Space Environment Monitor (SEM), a Data Collection System (DCS), and WEFAX. GMS-1 was launched in July 1977 and GMS-2 in August 1981.

- o Visible and Infrared Scanning Radiometer - This scanning sensor provides data on a near-continuous basis in the visible spectra at 1.25 km resolution and the infrared channels at 5 km resolution.
- o Space Environment Monitor (SEM) - The SEM monitors solar activity and the space environment by measuring the flux of solar protons, alpha particles, and electrons.
- o Data Collection System (DCS) - This communications system relays environmental data acquired by earth collection platforms.
- o WEFAX - Imagery is transmitted every three hours in a form compatible with the other WEFAX services.

d. Indian National Satellite System (INSAT)

The operational INSAT system will consist of two spacecraft located in geostationary orbit at 74°E and 94°E longitude. The INSAT satellite combines meteorological remote sensing with telecommunications capabilities. The primary meteorological instrument is the Very High Resolution Radiometer (VHRR) which senses in the visible channel at 2.75 km resolution and the infrared channel at 11 km resolution. Additionally, INSAT has a Data Collection System (DCS). Full frame images are available every 30 minutes. INSAT-1A was launched in April 1982 but was deactivated in September 1982 after failure of its attitude control system. INSAT-1B was launched in August 1983.

e. USSR Geostationary Operational Meteorological Satellite (GOMS) (Launch expected in 1985)

The planned GOMS satellite will be located in geostationary orbit at 70°E longitude. The scanning radiometer will sense in the visible range at 2-4 km resolution and in the infrared channel at 12 km resolution. Images will be transmitted every 30 minutes. GOMS will include also a Data Collection System (DCS) and WEFAX capability.

2. Polar-Orbiting Satellites

a. U.S. NOAA/Advanced TIROS-N Satellites

The operational NOAA system consists of two satellites in sun-synchronous orbit at an altitude of 870 km. Equator crossing times are 1330 local solar time and 0730 local solar

time. The major observation systems on the polar-orbiting satellites are: the Advanced Very High Resolution Radiometer (AVHRR), the TIROS Operational Vertical Sounder (TOV), the Space Environment Monitor (SEM), and the Data Collection System (DCS). Major data transmission systems include: three S-Band transmitters at three frequencies, two VHF beacon transmitters at two frequencies, two VHF transmitters at two frequencies and a search and rescue communication system. The NOAA operational polar-orbiting environmental system was initiated in February 1966 with the launch of the Environmental Science Services Administration Satellite (ESSA-1).

Advanced Very High Resolution Radiometer (AVHRR). This scanning radiometer collects data in the visible, near infrared, and infrared portions of the spectrum. It provides these multispectral data at 1 km resolution. These data are also processed on-board to produce 4 km resolution data which are used to develop a global data set for central processing. Separate processing produces a 4 km analog, uniform-resolution data set for Automatic Picture Transmission (APT) purposes. Sensor outputs are used in the form of imagery and as radiances for quantitative product generation. Data are available for real-time transmission to both the APT and High Resolution Picture Transmission (HRPT) users, and for storage on the spacecraft tape recorder for later playback at NOAA's central receiving facilities in Alaska and Virginia.

The following are products and services available from the AVHRR:

- o Full resolution data are broadcast in real-time to HRPT stations, such as the ones operated by NOAA in Alaska and California.
- o Data from two channels (visible and thermal infrared) in the low resolution mode are continuously transmitted for local use by APT users around the world.
- o Detailed sea surface temperature analyses are used for locating thermal boundaries indicative of fish concentrations, analyzing and forecasting sea fog, and locating major current boundaries (Gulf Stream, Equatorial counter currents, etc.)
- o Information on the weather affecting global agricultural production, including the preparation of a "vegetation index" which depicts the general health of vegetation.
- o Snow cover maps used for estimating snow pack in watersheds to predict spring melt in support of flood forecasting and in support of water management programs.
- o Daily global weather analyses useful for evaluating and analyzing abnormal weather events (droughts, floods, severe storms, etc.) This provides a climatological record for studying long-term trends.

- o Global cloud cover maps of both visible (day) and infrared (day and night) imagery are used to prepare global analyses of weather patterns. The data are particularly useful over the oceans and in the Southern Hemisphere, where conventional meteorological data are extremely sparse.

TIROS Operational Vertical Sounder (TOVS). The TOVS system is comprised of the High Resolution Infrared Radiation Sounder (HIRS/2), the Stratospheric Sounding Unit (SSU), and the Microwave Sounding Unit (MSU).

The primary instrument providing tropospheric data, HIRS/2, provides data for the calculation of vertical temperature profiles, water vapor content at three levels of the atmosphere, and total ozone content. The SSU instrument provides temperature information in the stratosphere. This instrument is provided at no cost to the United States by the Meteorological Office of the United Kingdom. The third instrument, the MSU, is used in conjunction with the HIRS/2 instrument to assist in sounding computations to be made in the presence of clouds. Data from these three sensors are combined with data from other low-data rate instruments (Space Environment Monitor, SEM; Data Collection Systems DCS; etc.) recorded on the spacecraft for subsequent central processing. They are also included in the data transmitted to HRPT stations around the world. The TOVS instrument products include:

- o Mean temperatures for 40 atmospheric layers from the surface to 1 millibar (50 km).

- Precipitable water amounts for three layers of the atmosphere: surface to 700 mb (10,000 feet), 700 to 500 mb (10,000 to 18,000 feet), and above 500 mb (18,000 to 30,000 feet).
- Approximately 600 sounding retrievals are generated per orbit. The two satellites provide 16,000 global soundings per day.
- Quantitative data on the vertical structure of the atmosphere provide the essential basis for global analyses of weather patterns. These analyses form the initial conditions for the numerical weather prediction models used to produce forecasts for periods of 12 hours to 10 days.
- Global analyses derived by NOAA from the TOVS data provide information on insolation, precipitation, and surface temperatures and winds useful in global crop condition assessments and crop production estimates.

Space Environment Monitor (SEM). The SEM measures solar proton flux, electron density and energy spectrum, and total particulate energy distribution at spacecraft altitude. The two detectors included within this instrument are the Total Energy Detector and the Medium Energy Proton and Electron Detector. This instrument augments the SEM measurements made by the GOES system. SEM data from NOAA satellites are used to monitor and predict solar events, such as sunspots and flares, and their

effects on the magnetic field. Measurements of arriving energetic particles are used to map the boundaries of the polar auroral ovals which affect ionospheric radio communications, over the horizon radar systems, electric power distribution systems (particularly in the higher latitudes), high-altitude military and civil aircraft flights, and manned space activities such as Shuttle flights.

Data Collection and Platform Location System (DCPLS). The DCPLS is provided by the Centre National d'Etudes Spatiales (CNES) of France at no cost to the United States. The ARGOS Data Collection and Platform Location System (DCPLS) or ARGOS DCS provides a means to locate and collect data from moving and fixed platforms. This polar-orbiting satellite DCS augments the GOES DCS, and is used to collect data from fixed platforms not in view of the geostationary satellite (polar latitudes) and from moving platforms. The ARGOS DCS derives the position of moving platforms (drifting buoys, balloons, etc.) at the time of the data transmission. DCS data are combined with data from other low-data rate instruments on the satellite and broadcast directly or recorded for later transmission to the ground. From U.S. facilities, these data are sent via satellite to CNES/France for processing and location determination prior to distribution to users of the data.

The following are products and services provided through the use of the ARGOS DCS:

- o The relay of in-situ observations of surface and upper level ocean conditions and surface weather conditions. The location of moving platforms provides information on surface currents for buoys, or middle or upper level winds for balloons.
- o The capability to track the movement of oceanic research ships and marine animals in research programs.
- o The relay of in-situ environmental data from those platforms in the Arctic and Antarctic that are not observable from the GOES DCS. These data provide vital inputs to analyses of weather patterns transiting the polar regions.
- o ARGOS-equipped buoys are placed in regions where ocean currents are expected to carry icebergs into shipping lanes. Also, buoys are attached to already-drifting icebergs, to verify berg-drift forecasts based on ocean current rates.

Satellite-Aided Search and Rescue Project (SARSAT). The SARSAT capability on polar-orbiting satellites is a cooperative program involving France, Canada, and the USSR. The satellite equipment receives and relays signals from emergency transmitters on aircraft and ships. Local user terminals (LUTs) on the ground process data received directly from the satellite and provide to centers operated by search and rescue authorities the location of activated emergency transmitters. Two Soviet polar-orbiting satellites now carry equipment that

is interoperable with that aboard NOAA-8, launched in April 1983. More than 200,000 emergency transmitters are installed in ships and aboard commercial and private aircraft.

Data Transmission Capabilities. In addition to the satellite transmission capabilities needed by NOAA to command the satellite, to monitor the condition of on-board systems, and to transmit data to NOAA facilities for central processing, there are three communication systems used extensively by organizations other than NOAA. They are the Automatic Picture Transmission (APT), High Resolution Picture Transmission (HRPT), and Direct Sounder Broadcast (DSB) systems.

Automatic Picture Transmission (APT). The APT system consists of two Very High Frequency (VHF) transmitters, one operational and one back-up unit. Ground receivers are equipped to operate at either of the two transmitter frequencies. There are almost 900 of these receiving stations around the world; over 600 of these are outside the United States, in over 120 countries. Data over a local area are acquired while the satellite is in view of a ground station. The APT broadcasts two channels (visible and infrared) of AVHRR data at 4 km resolution. Such data are intended for viewing local weather conditions.

High Resolution Picture Transmission (HRPT). The NOAA polar-orbiting satellites carry three S-Band transmitters. Two

of these are dedicated to transmitting data to facilities in the United States. The third provides redundancy in U.S. acquisitions, and also serves as the HRPT transmitter, which constantly broadcasts the high resolution AVHRR data to any ground station equipped to receive the signals. HRPT, like the APT, is used extensively in other nations. There are 46 stations owned by users in 23 countries.

Direct Sounder Broadcast (DSB). Direct Sounder Broadcast services are derived from the operation of the TIROS Operational Vertical Sounder (TOVS) instruments, including the SSU developed by the United Kingdom and flown on TIROS-N series polar-orbiting spacecraft. Data from the current instruments, when processed on the ground, provide a detailed profile of atmospheric temperature and humidity.

b. USSR METEOR-2

The METEOR-2 operational program consists of two or three satellites in a polar-orbit at an altitude of 900 km. Equator crossing times for the satellites are 0300 and 1500 local time, respectively.

The primary instruments are as follows:

- Scanning telephotometer that acquires data in the visible band of the spectrum at 2-km resolution. Data from this sensor are provided to the automatic picture transmission (APT) service.
- Television-type scanning instrument with a capability to sense in visible bands at 1-km resolution.

- o Infrared scanning radiometer that acquires data in the region at 8-km resolution.
- o 8-channel infrared scanning radiometer that acquires information on the vertical distribution of temperature, but is not on all METEOR-2 spacecraft.
- o Penetrating radiation radiometer used to acquire data on the fluxes of penetrating radiation in the region near the Earth.

B. CURRENT U.S. DATA REQUIREMENTS

In considering the current U.S. systems, in particular, one must keep in mind the U.S. Government data requirements which have defined these satellite capabilities. Beginning with the National Space Act of 1958, there has been a consistent separation of civil and defense roles in space technology. On the one hand, the Department of Defense (DOD) uses space technology for U.S. military and security interests. The civil program promotes U.S. scientific and technological leadership, enhances international cooperation for foreign policy objectives, and meets civil agency needs. Pursuant to this end, agencies developed requirements for the National Operational Meteorological Satellite System in 1961. The system was begun to satisfy civil national and global

environmental monitoring needs. DOD requirements have been defined through separate mechanisms in order to meet specific missions.

To meet these sets of requirements, U.S. meteorological data requirements are met by separate systems under separate management. This arrangement, however, is not mutually exclusive. Where possible the civil and defense systems employ common components, and these systems are mutually supportive with a regular exchange of acquired meteorological data. Clearly though, a satellite system responsive to U.S. defense needs is a paramount national requirement.

The primary reasons for the continuation of separate programs are the clear distinctions in their missions. The Defense Meteorological Satellite Program (DMSP) is under direct military command authority and must be fully responsive to the needs of national security. The civil program supports requirements of the National Weather Service, as well as fulfilling the U.S. obligations in the free exchange of weather data among nations. Though there exist separate missions, the civil and defense programs share some common data requirements. They include global mapped and gridded imagery, global atmospheric vertical temperature and moisture profiles, global thermal radiation maps, space environmental parameters, global precipitation estimates, soil moisture, and surface winds.

At a minimum, future global systems that involve the United States must meet the current civil data product requirements, as well as those DOD data product requirements currently being met by the U.S. civil system. Such needs can be met in principle because DOD utilizes and contributes data available through the GTS, which is the vehicle for facilitating the free international exchange of data. On the other hand, an international civil system not under U.S. control would not be as responsive to U.S. military concerns, particularly in times of national emergency.

C. FUTURE CIVIL SATELLITE CAPABILITIES

For the purpose of discussion, an international system, to be effective, would take into account not only current requirements but also projected capabilities. A baseline system would employ present technology, where appropriate, in addition to the planned advancements for today's systems. For example, the METEOSAT program envisages for the next generation of satellites the ability for simultaneous operation of the infrared channel, the water vapor channel and both visible channels; a capability not present in today's system. Additionally, plans are being developed to provide communications links for meteorological data exchange between weather stations not directly linked to the GTS, particularly those in developing countries.

The future requirements of the U.S. geostationary and polar-orbiting systems have, in principle, been defined. For the GOES system, specifications call for high resolution images to be provided from visible, infrared, and water vapor data. More channels are to be provided than the current system. Spatial resolution will range from 1 km for visible imagery to 4 km for the infrared channels to 8 km for water vapor. Plans call for improvements to be made in the GOES atmospheric sounding capability. This includes the ability to acquire abbreviated profiles of temperature and humidity at 25-30 km resolution of the United States on a half-hourly basis with more complete profiles from the surface to the tropopause within one-half hour of observation twice per day. The sounding requirements will be met without disrupting the acquisition of imagery--a capability not possible today. Direct readout and DCS capabilities, as well as the SEM, will remain as part of the satellite configuration. Also, a search and rescue capability will be included.

For the NOAA polar-orbiting system, a 20-channel Advanced Microwave Sounding Unit (AMSU) as part of the TOVS instrument is planned. This unit will be developed jointly with the United Kingdom. The next generation of NOAA satellites will include HRPT, APT, DSB, Search and Rescue, and ARGOS DCS services as well as the SEM.

D. SUMMARY

The preceding discussion illustrates the present arrangements in meteorological satellite remote sensing. Through the system of regional geostationary satellites, the global environment is monitored on a near-continuous basis. The polar-orbiting spacecraft provide global coverage twice daily as well as using different capabilities. Data from all these systems are received directly from the satellites or through the GTS. International coordination has ensured that such coverage is available and the data acquired are complementary and compatible. Further, unique capabilities, as well as future developments of the individual programs, were outlined, emphasizing the different national requirements.

In addition, it is clear that the United States has certain requirements that its satellite systems fulfill. Apart from meeting domestic weather forecasting needs, the civil program supports global monitoring requirements and international data exchange obligations, as well as military and national security interests. U.S. participation in a system not within its total control will be contingent upon meeting sufficiently the present civil system mission. In summary, for an international system to be viable, it would have to provide the current complement of sensing capabilities and take into account the planned system improvements. From a U.S. view, certain basic mission requirements, i.e., national and international weather monitoring and forecasting, and military support, must be considered.

III. DESCRIPTION OF POSSIBLE ORGANIZATIONAL MODELS

There are a relatively few international organizational models that could be applicable to designing an international system to meet international weather satellite data needs. This chapter outlines briefly what those models are and how they might be modified to fit the requirements for an international meteorological satellite system. More background material on each of the organizations used as models is given in Appendices A-G. The following paragraphs will address general institutional, policy, and financial issues necessary to compare the relative strengths and weaknesses of each model.

A. COORDINATION ON GEOSTATIONARY METEOROLOGICAL SATELLITES (CGMS) MODEL

The model described in this section is based on the Coordination on Geostationary Meteorological Satellites (CGMS) group as discussed in Appendix A. CGMS is an informal, ad hoc, technical forum used to coordinate and rationalize national programs in geostationary meteorological satellites. Decisions made in the forum are based on the consensus of its members and are non-binding. The scope of CGMS is limited to the geostationary meteorological satellites; however, its scope could be expanded to include the polar orbiting satellites; or, alternatively, groups patterned after CGMS could be established to deal with areas such as coordination of polar-orbiting meteorological satellites or continuity of meteorological satellites in general through increased international coordination. This section will discuss two variations of the CGMS model: the expanded CGMS and the establishment of a parallel group for Coordination of Polar-Orbiting Meteorological Satellties (CPOMS).

Under either the expanded CGMS or CPOMS, technical representatives of national or international agencies operating meteorological satellites would agree to meet to encourage informal technical cooperation. The World Meteorological Organization (WMO), which is active in the CGMS, would be expected to have a role in this cooperation. The objective of the cooperation would be to ensure adequate global meteorological satellite coverage through compatible national systems and, in some cases, through sharing of costs. Increased compatibility and complementarity in such technical areas as spacecraft orbits, data formats, downlink frequencies, and sensor capabilities, can reduce the cost of remote sensing data reception, processing and analysis for each nation. System complementarity would be achieved on an informal technical level, thus producing some cost savings without compromising national agency autonomy or creation of a new bureaucracy.

Membership in the expanded CGMS would consist of national and international agencies that are: (1) currently operating meteorological satellites; (2) planning to operate meteorological satellites; or (3) contributing instruments for flight on meteorological satellites. If appropriate, some kind of associate status could be established to include agencies that contribute voluntarily to the construction, launch and/or operation of a common satellite. Membership in CPOMS would consist of the same four categories as above except that only those national agencies involved in the funding and operation of the polar-orbiting meteorological satellites would be eligible to participate. Membership in CGMS would

not imply membership in CPOMS. If appropriate, however, a CGMS/CPOMS joint committee could be established to deal with issues of mutual concern.

It is useful to point out that the global coverage provided by the polar-orbiters would seem to argue for greater sharing of costs among the beneficiaries of the polar-orbiting satellite data. That is, the low orbit of the polar-orbiters enables each satellite to view the entire Earth twice a day, potentially providing all nations with real-time, high-resolution imagery. Each geostationary satellite views a single geographic region. There has been some discussion in various international fora of the eventuality of a jointly funded polar-orbiting satellite, should the U.S. decide that national needs no longer warrant the expenditures required to maintain a two-satellite polar-orbiting system. CPOMS membership, or perhaps a subgroup of the expanded CGMS, would include nations and/or organizations that have expressed interest in maintaining the continuity of the current system. In that the sharing of costs would involve budget and policy considerations, national representatives would speak to both technical and program issues. The discussion, however, would still be informal and non-binding unless and/or until members of the group determine it appropriate to formalize an arrangement.

Satellite systems would remain the property of national governments; however, data would continue to be available on a free and unrestricted basis. Policy determination, procurement, system design, system management, and funding, likewise, would remain in the hands of national governments. Ultimately, therefore, the degree to which a

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decision is implemented would be determined by independent agency authorities according to their perception of the benefits and costs associated with any given action.

In the event that nations choose to participate in other nations' meteorological satellite programs by funding, providing instruments to fly on a satellite, or some other contribution, specific bilateral or multilateral agreements would be concluded. Again, while the coordination groups would encourage international cooperation both in progress towards technical compatibility/complementarity and in cost sharing, the decision to adopt a group recommendation or to collaborate in any given bilateral or multilateral project would remain within the purview of national agencies.

CGMS is successfully guiding enhanced compatibility and complementarity among the national geostationary meteorological satellite systems of the United States, ESA, India, Japan, and the USSR. This forum could be expanded to include the polar-orbiting satellites; however, this may prove to be cumbersome. The United States operates two polar-orbiters and the USSR operates one. Both operators are party to CGMS. Inclusion of governments that provide instruments for flight on U.S. satellites would add Canada, France, and the United Kingdom in the discussions. These countries are not members of CGMS. As demands for world coverage increase and national funds become more limited, other governments would probably become involved. The discussion of policy issues that may involve the expenditure of national funds for an international program would call for a higher level of representation. Nevertheless, both an expanded CGMS or CPOMS

could be implemented fairly easily. In either case, cooperation would not require concluding any formal arrangements. Discussions which could lead in this direction have already taken place through the Working Group on Technology, Growth and Employment of the Economic Summit of Industrialized Nations (Canada, France, Germany, Italy, the United Kingdom, the United States, and the European Community) with the cognizance of the Secretary-General of the WMO. Work within this context will continue.

B. WORLD METEOROLOGICAL ORGANIZATION (WMO)

The following model is based on the World Meteorological Organization (WMO), more fully described in Appendix B. This type of body would be an intergovernmental organization established through government ratification of a formal convention. Membership would consist of those nations or territories which have a functional interest in the purposes of the organization (i.e. meteorological services). All members would be granted one vote in determining the functions and activities in which the organization would be involved. Membership would incur an obligation to assist in funding organization activities through percentage contribution determined by a formula similar to that used for national contributions to the U.N. general fund.

Final decisions on the organization's policies would be determined by the plenary body which would consist of one representative of each member nation, each having one vote. This body would meet once every four years to consider issues raised by individual members and to act on recommendations made at the managerial level of the organization concerning general policy. Benefits and services furnished by the organization are intended for members. Non-members may receive some assistance through sponsorship by a member. An executive body (Executive Council) would be responsible to the plenary body for coordination of the organization's programs and for utilization of budgetary resources. A secretariat (Secretary-General) would serve as the link among members, being the administrative, technical, secretarial, and information center for the

organization. The secretariat would have management responsibility for programs designed to implement the policy objectives of the organization. One example of a program for which the WMO provides administrative coordination is the North Atlantic Ocean Stations (NAOS) (see Appendix C). An instance of a program which the WMO manages is the Global Telecommunications System (GTS), details of which can be found in Appendix D.

Maximum budget expenditures would be determined by the plenary body. The expenditures would be determined by estimates, recommendations and comments given by the executive body and secretariat, as well as individual members of the organization. Contributions to budget would be apportioned among all members in amounts determined by the plenary body. The greater share of contributions would be received from developed nations. Other funds could be established by the plenary body. The purpose and the amount advanced by members for these funds would be determined by the executive body. In addition, the secretariat could establish reserve and special accounts to be used for the organization. As the organization would be funded through budget contributions given by members and through voluntary arrangements in which members participate, no other organizational charges would be made to members.

Satellite system design in this intergovernmental organization would be decided by the Congress, based on recommendations made by the Executive Council. Presumably a working group or ad hoc committee would be designated by the Executive Council to compile a report on potential system design from which the Council could make a

recommendation. Once the design phase is complete, the Secretariat would administer a contract, the cost and obligations under the contract being controlled by the Congress and the Executive Council. The contractor might be an agency of international repute in satellite operations such as the European Space Agency (ESA) or the U.S. National Oceanic and Atmospheric Administration (NOAA). It could also be a specially established Secretariat group. This agent would then procure and operate the international meteorological satellite system. If an outside contract to established satellite agencies was not desirable to the organization's members, then creation of the international satellite system would require procurement of appropriate facilities and selection of skilled staff to operate the system in-house, with the Secretariat administering the arrangement on behalf of the members. Procurement would be based on budget authorization and guidance from the Congress. Selection would be on an open and competitive basis, with consideration being given to national return on amounts spent.

An international meteorological satellite system modeled upon an international body such as the WMO would require a high level of government involvement. Participation by the United States in this type of organization would require approval by the U.S. Senate, as a convention is equivalent to a treaty. Selection of an appropriate representative and focal point within the U.S. Government would be required to facilitate any international meteorological satellite agreement. For example, the Department of State has designated the head of the National Weather Service within NOAA in the Department of

Commerce (DOC) to serve as the U.S. Permanent Representative to the WMO. NOAA serves as the focal point to coordinate U.S. efforts in WMO international programs, implement those service improvements in the existing international weather system for which the U.S. accepts responsibility, and develop new technology as related to its responsibilities.

Implementation of this type of organization would require a number of years to organize. A series of intergovernmental meetings would be required to develop a convention for review and ratification by individual states. Ratification alone would be a lengthy process. In addition, acceptable financial, technical, and administrative practices must be established. Prior to full implementation, some interim arrangements would be necessary.

C. EUROPEAN ORGANIZATION FOR THE EXPLOITATION OF METEOROLOGICAL SATELLITES (EUMETSAT) MODEL

The general model described in this section is based on the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) as discussed in Appendix E. EUMETSAT is essentially a regional organization; however, its scope could be expanded to encompass participation by non-European states. In this instance, countries such as the United States could join EUMETSAT, subject to the approval of the Council, by ratifying the existing Convention. Membership in this organization would require states to provide financial support for the development and operation of meteorological satellites.

Given the regional nature of this organization, it is assumed that membership would not necessarily be open to all interested states. For example, one concept for an expanded EUMETSAT (EUMETSAT-Plus) would include European states as well as non-European countries that could contribute significant technical capabilities and financial resources. In this case, non-European states would include countries with meteorological satellites, India, Japan, and the United States, along with industrialized nations such as Australia and Canada. In this arrangement, maximum financial and technological resources would be focused in one organization.

Under this scheme, each Member State would participate on the Council and be entitled to one vote. The Council would be responsible for defining overall policy and operational specifications for the satellite system, deciding on the accession of states to the organization, approving agreements with states or international organizations, adopting an annual budget, appointing a Director for the organization, and approving contracts involving large sums of money.

The organization would not manage directly the satellite system. Rather, it would purchase the spacecraft and have other entities operate the satellites on a contractual basis. For example, EUMETSAT-Plus would purchase two polar-orbiting and five geostationary satellites as well as related ground equipment, as a baseline global system. Command and control and scheduling activities would be the responsibility of the current satellite operators--ESA, India, Japan, and the United States--under contract to EUMETSAT-Plus. In this case, the Director, appointed by the Council, would be responsible for monitoring the management contracts and dealing directly with each command and control facility. As well, the Director would prepare and implement the budget, draft tender invitations and contracts, incur expenditures, conclude certain contracts, and act as legal representative of the organization. The Director would act under general policy direction from the Council.

Though this organization would be limited in its membership, all states would have access to the system. Data would be available through direct readout and international arrangements such as the GTS. Data reception and processing would be the responsibility of national or regional weather services, or, to some extent, EUMETSAT-Plus. To meet the needs of non-Member States, this organization would work closely with the WMO to coordinate relevant activities. For example, system design of the space segment would be the responsibility of the Council; however, recommendations from the WMO would be taken into account.

The procurement of hardware, spacecraft, and launch services would be on a competitive basis among the members of EUMETSAT-Plus. Though there would not necessarily be specific requirements for industrial return, it is assumed that major contributors to the organization could expect a commensurate level of business from EUMETSAT for their respective aerospace industries.

Funding would be based on fixed contributions set at the time the organization is established. The level of commitment would be determined by each Member State, in consultation with the other members. In considering funding levels, each Member State would take into account its present national meteorological budget as well as its interest in making EUMETSAT solvent. Contributions from non-Member States would be acceptable but would not confer any voting rights.

EUMETSAT-Plus would be an intergovernmental organization established through a Convention ratified by each Member State. One can expect this process to take a number of years. In the meantime, certain interim arrangements would be necessary. Though this proposed scheme would not have broad participation, it would offer satellite operators an opportunity to reduce somewhat system costs and at the same time maintain an acceptable level of control. The general structure would take advantage of the existing system of national programs. What would be required is a formal mechanism to unite them into one centrally-funded and managed system.

D. INTERNATIONAL TELECOMMUNICATIONS SATELLITE ORGANIZATION (INTELSAT) MODEL

This model for an international meteorological satellite system is based on the organizational model of INTELSAT described in Appendix G of this study. However, it should be noted that the [illegible] assumes one major difference from that of INTELSAT's. In the IM[illegible] organization, the use of telecommunications facilities carries a charge to users. This scenario differs from the INTELSAT case in that it assumes meteorological data products and services would not be earning revenue directly. Instead, the scenario would have funding for the international system derived wholly from contributions by member governments. It is therefore likely that a "not-for-profit" or governmental corporation might be the most appropriate structure. Another example of an international telecommunications organization is the European Telecommunications Satellite Organization (EUTELSAT) (See Appendix F). This model, however, represents a regional, rather than global, consortium.

The international meteorological satellite system would function through an intergovernmental organization that provides global meteorological data to the world community. The organization would operate and manage a space segment and supporting ground command, control and tracking facilities. Earth receiving stations and meteorological services would be wholly owned and operated by individual nations. Membership in the organization would be open to any state that is a member of the World Meteorological Organization (WMO), and representatives to the

organization would be chosen by national governments and national satellite operator agencies or meteorological organizations directly responsible to their respective governments. Membership and organizational activity would be established through member governments' ratification of a pair of agreements, one being an agreement concluded among participating national governments and the other being an operating agreement among the governments or their designated operational meteorological entities. The agreements would be cooperatively developed, taking into account the needs and desires of potential members. Access to and use of meteorological data from the organization's satellite system would be guaranteed for all non-member nations as well as for the States party to the organization's agreements. The level of influence on the organization's system design and institutional policies would be determined by the type and degree of contributions to the organization by its signatory members.

Institutional management of the organization would be accomplished through the activities of four functional organs: a directorate, an executive, and two plenary bodies reflecting the representation of national governments and of their operational entities.

A Board of Directors composed of the organization's major contributors would meet bi-monthly and provide primary managerial direction, so as to be responsible for all decisions concerned with the design, development, construction, establishment, operation and maintenance of the organization's space segment. The Board would be assisted in these decisions by technical, planning, and

financial advisory committees. Each member of the Board would have, in principle, a vote equal to his member nation's contribution, yet no board member could cast more than perhaps 40 percent of the total vote. The difference between individual contributions represented and the 40 percent limit would be distributed equally among the other board members. Unilateral veto power would not be accorded any organization member on the Board.

The executive body would be responsible to the board of directors for the performance of all functions relating to the management and operation of the organization. The executive would be headed by a Director General who would act as the organization's chief executive officer and represent the organization's juridical personality.

An assembly of operators would be composed of representatives of meteorological organizations signatory to the operating agreement, and would consider the financial, technical, and operational policies for the system. As well, this assembly would deliberate on any recommendations or resolutions put to it by the other functional organs. The counterpart of the assembly of operators would be the assembly of governments, consisting of national representatives of all government signatories. The assembly of governments would meet every two years to consider sovereign concerns, organizational policies, and--as with the assembly of operators--any recommendations or resolutions referred by the other functional organs.

The organization's agreements would provide for multilateral system funding through members' contributions to the overall cost of the system's components, products, and services. The organization would cover operating costs with these contributions, and would include in its financial requirements the costs of institutional management and of research and development for the improvement of system capabilities. Contribution to the system and the degree of use of meteorological satellite data would not be correlated, as the frequency and extent of meteorological data available would be equal for all parties. However, as indicated above the influence of signatory members on the direction of system design and management would be directly related to the degree of financial, technical, and capital input by individual members.

IV. CRITERIA FOR EVALUATING ORGANIZATIONAL MODELS

In considering possible international arrangements to ensure continuity of satellite meteorological data, from the U.S. perspective, any system must meet certain basic technical, financial, and policy requirements. Foremost in consideration is the extent of U.S. Government control within the institutional framework of the international system.

A. NATIONAL SECURITY

Today, the United States enjoys maximum flexibility in the design and operation of its meteorological satellites. A multilateral arrangement would not, of course, afford such an opportunity. Equally important, is the extent to which an international system could meet U.S. military requirements. Presumably, data to support defense meteorological activities would continue to be provided under the current and any future arrangements for the international free exchange of data. What would be missing is the Department of Defense's ability to preempt civil weather satellite operations during times of national emergency. With an international organization, the United States would have no unilateral authority over the system. Another issue related to U.S. control is the ability of this system to meet essential requirements for severe storm warning and monitoring in the United States. At present, routine satellite operations can be quickly altered to monitor severe weather events such as hurricanes and tornadoes or conditions conducive to such events. Other observing activities, whether domestic or international, are superseded in these instances. Conflicting requirements to meet the needs of contributing countries in an international system would have to be taken into account.

B. COST AND CONTROL

Another important factor in determining the feasibility of an international system is the level of support required from the United States. At issue would be whether the cost for participation would be more or less than is currently spent on the total U.S. satellite system. One could argue that factors such as commonality of hardware and technology would result in economies of scale, making it less costly for satellite operators to participate than to maintain individual systems. With this in mind, however, attention should be given to the balance between the level of support and the extent of control within the organization. Reduced costs for satellite development and operation might not always be in the U.S. interest, if accomplished at the expense of flexibility and control.

In considering the cost to nations participating in system funding, one must also examine the potential for industrial return on investment. Nations with a satellite development capability would expect some level of business for their aerospace industries commensurate with their contributions to the organization. As well, those participating nations that are not engaged in spacecraft development but do have a capability to construct ground receiving and processing hardware would also require some return for their respective industries. The interests of these two groups should be addressed when considering the relationship between contributions and the expected volume of business from the organization.

Satellite data play an important role in weather forecasting and monitoring. For this reason, it is imperative that an international mechanism provide a high degree of service reliability and continuity. National systems are under direct government control and responsive to domestic needs. In order for an international system to be generally accepted, there must be confidence that essential meteorological activities will not be subject to the vagaries of international politics.

C. TECHNOLOGY TRANSFER

As it stands today, U.S. firms lead the world in the manufacture of meteorological satellites. The U.S., Indian, and Japanese spacecraft were built by U.S. companies, while the ESA satellites were constructed in Europe, but benefited from prior U.S. technology. One can expect that the Europeans will move to advance their capabilities and that the Japanese, as well as the Indians, will work to develop an indigenous capability for meteorological satellite development. Under a multinational organization, industrial return for participants would be required. This may work to the disadvantage of U.S. companies, since they would be forced to share the potential market with other concerns. On the other hand, increased

competition in this area may stimulate a competitive industrial R&D effort that could maintain the U.S. competitive edge. In a similar vein, U.S. industrial and security interests must be protected from disadvantageous technology transfer. Presumably, detailed specifications for satellite development would be made available to the organization as a normal course of business. Appropriate measures will have to be taken to avoid the transfer of militarily sensitive technology or trade secrets, but a number of mechanisms are already in place to control such transfers.

D. RESEARCH AND DEVELOPMENT

For a system to be effective, it must have the capability to adapt to changing requirements and technological advances. For example, to meet the data requirements for as many countries as possible, a system would have to employ a level of technology that can be dealt with by its most unsophisticated user. A "lowest common denominator" system, while addressing the needs of a wide spectrum of users, may not be the best for nations with a higher degree of technological capability. Advanced R&D in meteorological satellite technology could be the responsibility of the international organization or national agencies or, on the other hand, ignored, depending on the willingness of member states to pursue change. As a leader in satellite technology, the United States would have to evaluate the potential impact an international mechanism would have on future research.

E. ROLE OF NON-PARTICIPATING NATIONS AND NATIONS WITHOUT SPACE CAPABILITY

Depending on the institutional arrangement considered, the role of the non-participating state in the funding of the system must be taken into account. Organizations such as INTELSAT and INMARSAT offer participating states without a satellite capability the opportunity to contribute directly to the definition and operation of the space segment, but not non-participating states. Many countries, particularly in the developing world, are not only concerned with data continuity and availability, but also with having a formal mechanism to ensure that their needs are met by existing and planned satellite systems. To this end, many countries have called for the United Nations to provide, in one form or another, such an approach. At the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE-'82), the final report, for example, called for international arrangements to ensure access to and continuity of meteorological data for developing countries as well as to coordinate technical parameters of satellite systems to encourage compatibility and complementarity. For this reason, it will be necessary to determine whether the organization would satisfy the desire of lesser developed countries, both participating and non-participating, for control and input to the management of an international system and in the conduct of remote sensing using such a system.

F. ROLE OF PRIVATE SECTOR

In light of current discussions regarding the transfer of meteorological satellite remote sensing to the private sector, the role of a potential private operator requires consideration. Presumably, if the United States were to participate in an international system, a private firm could provide the U.S. contribution, such as is the case in the area of communications satellites and INTELSAT. The U.S. Government would look to the international organization to provide all its required data. The level of concern regarding this issue would, of course, be dependent on the membership of the organization.

G. FEASIBILITY OF IMPLEMENTATION

A final consideration is the feasibility of organizing an international entity. In some instances, a formal convention must be drafted and ratified by the participating states. Other arrangements may require only a higher degree of cooperation and/or coordination than presently exists. As well, different arrangements may be more attractive to countries or groups than others. This may be for legal, financial or political reasons. Finally, the time required for implementation may also be a factor. It could be self-defeating to choose an institutional arrangement to ensure data continuity which is so complicated to establish that years may pass without adequate global service.

The preceding has described briefly the major issues which should be considered in evaluating different schemes for

international collaboration. Of course, the various options are well-suited to meet specific concerns. What is important is that these concerns are weighed in relation to the overall objective of ensuring long-term satellite data continuity on an open basis.

V. EVALUATION OF ORGANIZATIONAL MODELS

This chapter will review briefly each model based on the criteria described in Chapter IV. No attempt has been made to identify which model is best suited for an international satellite system. Rather, the purpose is to evaluate how each model addresses the issues identified. It is, however, clear that modest changes from current practice are easiest to effect, while the establishment of a new international organization is likely to be a controversial venture at best.

A. COORDINATION ON GEOSTATIONARY METEOROLOGICAL SATELLITES (CGMS) MODEL

The basic model discussed in this section is described in Chapter III.A with two variations, expanded CGMS and Coordination of Polar-Orbiting Meteorological Satellites (CPOMS). Both variations will be treated as one unless specific reference is made.

1. National Security

In that the decisions made in the CGMS-type group are non-binding on the national operators, the United States would continue to enjoy maximum flexibility in the design and operation of its meteorological satellites. Should informal discussions result in a formal commitment to share the costs of a satellite, national security issues would need to be reevaluated. That is, depending on the terms of the agreement, those countries which contribute funds and technology would also share, to some extent,

the control of the satellite. The potential for loss of U.S. autonomy under such an agreement would have to be balanced against potential cost savings. Final decision to conclude agreements would remain in U.S. hands, rather than in the hands of a delegated international organization such as in the case of the EUMETSAT-Plus or INTELSAT models. Because control of the meteorological satellites remains in U.S. hands, this model allows for the greatest flexibility in providing for national security.

2. Cost and Control

With the freedom to control the design and operation of a system comes the complete burden of financial support. The CGMS model gives maximum autonomy to the United States for system design and operation, but may also impose the greatest burden on the United States to fund the system. Depending on the willingness of nations to collaborate, however, informal consensus on technical concerns could reduce costs for national operators substantially. Moreover, the informal technical atmosphere provided by the CGMS type model would encourage collaboration. Instruments provided by one nation for a satellite operated by another has proven a successful means of reducing U.S. costs. Should talks in the expanded CGMS/CPOMS forum result in an agreement to share the cost of a polar-orbiting meteorological satellite, the United States financial burden would be further decreased, probably with only minor, if any, restrictions on national control. This assumes that the remaining U.S. polar-orbiter provides sufficient back-up to the Defense Meteorological Satellite Program (DMSP) and that data from the international system are available to DOD.

Under this arrangement, satellite operating nations would continue to rely heavily on their own aerospace firms for spacecraft development. For U.S. businesses, CGMS/CPOMS offers substantial industrial return, since the majority of the meteorological satellites are built currently by U.S. firms. It is expected that countries will become autonomous as soon as possible. In particular, both Japan and India are not likely to remain customers of U.S. aerospace industry beyond the current generations in any event. There would be no specific requirement in the CGMS/CPOMS model that contracts be apportioned based on requirements except, of course, in the case of cooperation in the development of instruments and/or satellites.

3. Technology Transfer

The CGMS model of informal cooperation would continue the relatively firm control the United States has on the advanced technology associated with satellite meteorology. Technology exchange would be limited to what is required for development of compatible and complementary space segments or cooperative programs. Expansion of national systems presumably would favor indigenous industries. For the United States this means domestic firms would be more likely to retain their leading role in the construction of meteorological spacecraft. Some concessions to other countries' industries may have to be made should the United States agree to a jointly funded polar-orbiter or back-up geostationary meteorological satellite.

4. Research and Development

Mutual advantage is the principal, if not the only, motive for cooperation under the CGMS scenario. Countries participating in CGMS/CPOMS would be at about the same level of technical competence. As is currently the case in CGMS, member countries would share a common interest in applying R&D to the advancement of satellite meteorology in general, and national systems in particular. Discussions in this informal arena would be conducive to joint research projects. However, most R&D projects would be national in nature. Under this scenario the United States would be free to pursue research programs considered to be in the national interest without having to justify the expenditure of funds for these programs in an international political forum.

5. Role of Non-Participating Nations and Nations Without Space Capability

Beyond what currently is available, non-satellite operating countries would have little role in the expanded CGMS/CPOMS model. Non-funding nations and nations without a space capability would continue to express primarily their requirements through the United Nations, the WMO, and through direct diplomatic means. If appropriate, countries could be invited to participate in national satellite programs by providing instruments for flight, and/or by helping to fund a joint polar-orbiting meteorological satellite. Under this model, however, issues of data continuity and input into the design and operation of the satellites would remain of concern to countries not directly involved in CGMS/CPOMS, especially the developing countries.

6. Role of Private Sector

Presumably, should the meteorological satellites be transferred to the private sector, the principal private operator of the system would represent the United States in CGMS/CPOMS. Because the goal of informal cooperation would be to reduce the cost of operating the system while meeting user requirements, private sector firms should be as interested as a government agency to cooperate in such a forum. The private sector may not be interested necessarily in reducing the costs for the government. The sharing of a polar-orbiter would only be interesting to a private firm if appropriate arrangements could be made to ensure a reasonable profit. For example, if the private firm were told the United States can no longer afford to purchase the data from a second polar-orbiting meteorological satellite unless there are significant reductions in the price of the data, the private operator might then consider a cooperative international polar-orbiting satellite to reduce cost.

7. Feasibility of Implementation

No formal arrangements would be required to establish an expanded CGMS or a CPOMS. Either arrangement could be established fairly quickly by informal meetings and exchange of letters. Because the CGMS already demonstrates the successful implementation of this kind of system, there remains little doubt as to the feasibility of continuing and expanding its cooperation. Discussions which may lead to greater informal cooperation in meteorological satellites are already underway in the context of

the Economic Summit Working Group on Technology, Growth and Employment, with the cognizance of the Secretary-General of the WMO. Summit experts will meet in February 1984 to consider expanded cooperation. Technology transfer and research and development are factors which are unchanged from the current method of funding and operating the systems. It can also be noted that this framework allows expansion of formal ties as appropriate, including such enhancements as further contributions of instruments and hardware for use on the weather satellites. This could produce significant added cost savings for the United States.

B. WORLD METEOROLOGICAL ORGANIZATION (WMO) MODEL

The model discussed in this section is described in Chapter III.B.

1. National Security

Participation in any international satellite system could have some adverse effect on U.S. national security interests since the United States would no longer have unilateral control over the use of polar-orbiting and geostationary satellites for national requirements. As all members of this organization would have an equal voice in the decisionmaking process, competing international interests could preempt basic U.S. requirements. Due to the broad membership, attention also must be given to procedures which would ensure that national interests are protected, particularly in times of national emergency or natural disasters. To some extent, U.S. military interests will be met through the DOD meteorological satellite system. However, a back-up system of civil satellites would be unavailable under this international arrangement, although the data from the international system would presumably be available.

2. Cost and Control

It is assumed that a satellite system operated internationally might allow the U.S. Government some cost savings through shared funding of system design and operation. However, if funds contributed by the United States determined the amount of control which the United States had over the system, it would be in the U.S. interest to contribute a greater than average share of funding. The organizational structure of a WMO model does

not provide this opportunity as all members have one vote regardless of percentage contribution. Additionally, the United States and other industrialized nations traditionally contribute a greater share of funds, as their need for information is perceived to be greater--as is their ability to pay. Thus, U.S. financial and technical contributions would not likely be proportional to U.S. control under the WMO-type satellite system organization.

Under this model, participating nations with a space and ground segment hardware development capability would expect a certain amount of business for their respective industries. For U.S. business, this would in all likelihood mean that their current competitive advantage could be eroded through the apportionment of contracts.

3. Technology Transfer

The technology involved in any internationally-managed satellite system raises concern over disadvantageous technology transfer. Under the WMO model, information on satellite design and technical operations could be open for review and comment by all member nations. In fact, such information would be required in order that knowledgeable decisions can be made by states regarding the design of the system. The availability of technical specifications to all members would require the United States to balance the benefit of participating in such an organization with the possible detriment incurred by allowing nations with which relations are sensitive to obtain such technical information.

Should the United States choose to support a sophisticated system, formulation of firm technology transfer standards would need not only to be agreed upon in this international model, but also regulated in order to protect national security as well as U.S. private industry interests.

4. Research and Development

It is unclear whether a WMO-model international satellite arrangement would have the capability to support an active research and development program. Such a program would increase greatly the expenditures required for the system. Assuming that the organization's budget is allocated for satellite procurement and operation only, responsibility for research and development would fall to individual member nations. As governments of developed countries would be the most active in satellite research and development technology, the international organization would most likely encourage developed countries to address the needs of lesser developed countries (LDCs) in determining the types of research and development projects to be undertaken, as the LDCs do not have the resources to undertake such projects themselves. In order to maintain U.S. leadership in satellite technology, as well as to assure that the system's capabilities were constantly improving, the United States would incur costs associated with membership to the operational international satellite system, while also supporting internal U.S. research and development programs in satellite technology.

5. Role of Non-Participating Nations and Nations Without Space Capability

Although particular national agencies may be chosen to operate the international satellite system, all members under a WMO model would be involved in the design and operation of the satellite system. In addition, diverse management and policy considerations would be addressed and resolved through the normal organizational structure of the model. Those contributing countries without an independent satellite or ground system manufacturing capability would have an opportunity to participate directly in the management of a system that would meet their requirements. To this extent, developing country concerns about access to and continuity of satellite data will be met. However, those nations choosing not to contribute would not directly participate in the decision making process.

6. Role of Private Sector

Participation by a private operator under the WMO model would not necessarily be precluded. Though any convention establishing this organization would require government ratification, a private firm could be designated to participate. As is the case in INTELSAT, there would only be one U.S. designee.

7. Feasibility of Implementation

As a WMO model would require government ratification of a formal convention, establishment of this organization could take several years. An adequate convention would have to be developed, reviewed, and ratified. In the meantime, some interim arrangement

could be established, or nations presently operating satellites would simply continue to do so in order to ensure worldwide data continuity. One can assume that the WMO-model would have some support among both countries and international organizations. As such, outside pressures to circumvent the process would be minimal, unlike the case with options which would have limited membership. A further aspect of implementation feasibility is the generally cumbersome decision process that is associated with such organizations. Just as it complicates decisions within an existing organization, it also complicates any formation of a new entity.

C. EUROPEAN ORGANIZATION FOR THE EXPLOITATION OF METEOROLOGICAL SATELLITES (EUMETSAT) MODEL

The model discussed in this section is described in Chapter III.C as EUMETSAT-Plus.

1. National Security

Under EUMETSAT-Plus, control and management of the system would be shared among various nations. As a result, the United States could not exercise unilateral control in time of national emergency. However, as defined, EUMETSAT-Plus would, at its inception, consist of countries considered to a great extent to be allies of the United States. Membership being thus limited, such concerns could be mitigated through an understanding of common security interests. Such might not be the case with an arrangement which would include broader participation. Being a multilateral organization, conflicting requirements to meet the needs of contributing nations would remain a point of contention.

2. Cost and Control

The EUMETSAT-Plus model would offer each participant an equal voice in the management of the system, regardless of the level of contribution. Thus, decisions on system configuration and operational requirements must take into account the diverse needs of countries. To that extent, the United States would lose a significant level of autonomy. Again, however, the nations in EUMETSAT-Plus would share views consistent for the most part with the interests of the United States. Additionally, one could speculate that political debate would be kept to a minimum as long as membership

was limited to nations which shared common goals. Concurrently, however, the cost to the United States to maintain a global monitoring capability might be (although not certainly) less than it is today. Countries would share in not only the cost for the geosta tionary satellite system but also the polar-orbiting spacecraft program.

Under EUMETSAT-Plus, participating nations would expect a certain level of industrial return in line with their contributions to the system. This would include countries that build satellites as well as those that produce ground segment hardware. One could expect that such apportionment would reduce to some extent U.S. industry's share of the meteorological satellite equipment market.

3. Technology Transfer

In any international arrangement, it is assumed, a priori, that national import-export control regulations would play a major role. Presumably, states participating in EUMETSAT-Plus would have access to technical information relating to the design and construction of the satellites. As such, a certain level of technology transfer would occur. However, appropriate measures would have to be taken to avoid transfer of militarily sensitive technology or trade secrets.

Though the current EUMETSAT Convention does not specifically require any industrial return for Member States correlating to the level of contributions, it can be assumed that those nations with an indigenous satellite construction capability would expect a certain amount of business for their respective industries. This being the case, the United States could lose its leading role in the construction of meteorological spacecraft to others.

4. Research and Development

Member states of the EUMETSAT-Plus model would, for the most part, be at the same level of technical sophistication, and, hence, would share a common interest in investing in the development of advanced technologies to meet data needs. This being a multilateral organization giving each country an equal voice, however, it is clear that there will not always be total agreement on the direction R&D activities should take. Countries could continue separate R&D programs to meet national needs or agree to pool their resources to meet common requirements. For some countries such as the United States, maintaining a separate R&D program while contributing to an international system would be an added expense. On the other hand, a certain level of flexibility would be lost if all R&D is performed by an international entity.

5. Role of Non-Participating Nations And Nations Without Space Capability

Under the EUMETSAT-Plus model, contributions by states will vary; however, the level of participation could be equal. As well, within the decisionmaking structure, there will be no difference between those states with a satellite or ground station manufacturing capability and those without. To that extent, satellite operators will not have the same flexibility in system design and operation as they do today. This organization, on the other hand, offers the non-satellite operator the opportunity to participate in the development of satellite programs, which otherwise might not be available under current arrangements.

The EUMETSAT-Plus model does not allow for direct participation by developing countries that do not have a satellite capability. As such, this organization would not lessen concerns of the developing world about access to and continuity of satellite data. However, close coordination, as appropriate, with the WMO could do much to alleviate these concerns.

6. Role of Private Sector

In the early stages of the development of EUMETSAT, serious consideration was given to operating this organization as a commercial entity. Even as a not-for-profit intergovernmental organization, the participation by private firms operating meteorological satellites would not be precluded. A private operator could represent the United States in such an organization. Such is the case for U.S. participation in INTELSAT, where one telecommunications firm is designated as the U.S. representative.

7. Feasibility of Implementation

Being an intergovernmental organization, EUMETSAT-Plus would require the establishment of a new Convention or major revisions to the existing agreement. In either case, U.S. participation would require Senate approval through the treaty ratification process. The establishment of interim and then permanent arrangements would take several years. In the meantime, current national programs would continue to operate in the present manner. Additionally, the EUMETSAT-Plus model could encounter opposition from countries not included in the organization.

D. INTERNATIONAL TELECOMMUNICATIONS SATELLITE ORGANIZATION (INTELSAT) MODEL

A scenario for an international meteorological satellite system based on the INTELSAT model is discussed in Chapter III. D.

1. National Security

An international meteorological satellite system organized on the INTELSAT model would be operated by an intergovernmental organization. The INTELSAT model would have routine meteorological information needed by U.S. civil and military users globally collected and freely exchanged within the international community. However, given the international composition of the organization and the arrangement for its institutional management, the satellite system would not be available for unilateral U.S. military command and control in a time of national emergency. The capabilities of the international system might not be adequate to meet not only U.S. but other members' varied meteorological data needs. For example, the system's routine observations could interfere with the emergency monitoring of severe storms or other climatic disasters. Conversely, the interruption of routine observations in order to provide storm data could, at the same time, reduce the flow of data essential to accurate forecasting. Overall, for the requisites of national security to be achieved under this organizational model, individual and collective military and meteorological requirements would have to be assessed and provisions made for the potential lack of continuity in certain data.

2. Cost and Control

Influence on the direction and management of an INTELSAT-type organization would be determined through the level of members' contributions to the system. Of all members of the organization, the U.S. would be the most influential in terms of contribution share, as it currently operates the most complex national meteorological satellite system and could apply the greatest level of technological expertise. The cost to the United States--in terms of capital and expertise contributed versus services received and the degree of control maintained--would be dependent on the development of the organization and the evolutionary role of U.S. technical input. At the outset, the United States would be subserving control of its satellites and international meteorological system infrastructure to the organization, but would be persuasive in setting the course for overall system and services development. However, as happened with INTELSAT, any early U.S. influence would likely be moderated by a growth in status of the organization's other members (those currently or potentially able to pursue space applications). The national origin and technological configuration of the original satellite system would change as the individual satellites failed, new instruments were flown, and the source and proportion of contributions were altered.

It is assumed that states' representation in the organization would reflect membership in the WMO. In spite of the fact that the

influence of any one member's vote in the organization would be determined by the level of its contribution, the numerical superiority of non-satellite operators could compromise U.S. influence on longer-term system direction. It could also be assumed, however, that possible restrictions on the influence of the United States and other principal contributors would themselves be restrained by the realization that beneficial advancements in experimental and applied satellite meteorology would be in the interest of all participants. For the time being, such advancements would arise from the contributions of infrastructure, expertise and innovation from the United States and other technologically advanced nations.

Participating countries would expect to receive some industrial return from the organization. Such business would include contracts for satellites and ground segment equipment. While international apportionment of expenditures by the organization could detract from current U.S. preeminence in aerospace industries, it would stimulate the development of industrial capabilities in other nations.

3. Technology Transfer

The United States currently leads the world in the development and application of meteorological satellite technology, yet faces a growing competitive capability in the field from several other industrialized nations. The extent and rate of diffusion of this knowledge and equipment into the international

community has significant economic and strategic implications for the United States. In an organization modelled after INTELSAT, member countries would jointly operate the initial system and develop subsequent system improvements. It is through such international collaboration that disadvantageous technology transfer to competitors or potential adversaries could occur.

Under the INTELSAT model, an international meteorological satellite organization would encourage technologically-capable members to develop and contract for the manufacture of system components. Foreign research and development could be aided by the relatively easier access to information on methodologies and advancements afforded by joint collaboration on system design and operation. While increased competition would probably stimulate R&D, it is probable that the practice of industrial return would eventually impinge on American commercial preeminence. Additionally, although membership in the INTELSAT Organization proper is open to all nations, the USSR and most other Communist countries do not participate (having chosen instead to establish and operate the INTERSPUTNIK satellite telecommunications organization since 1974); however, given the scenario of an INTELSAT-modelled international meteorological satellite system, participation would be open to all members of the WMO--including the USSR and its allies. Unless the USSR again preferred to

establish its own meteorological data collection system, that nation could participate in the international organization and by its participation create the potential for undesirable transfer of Western technology that may have strategic applications.

4. Research and Development

The large and technologically-diverse membership of the INTELSAT model meteorological satellite organization would ensure that the needs of the most unsophisticated national user were addressed. However, these needs and the attractiveness of a "least common denominator" system to less-techologically developed users could restrain the level of the organization's R&D in both satellite systems and data applications. While a member of the organization, the United States could pursue its R&D activities to maintain national expertise independent of organizational needs, and also conduct R&D with the aim of more immediate application to the international system. Yet, even if the United States proposes state-of-the-art improvements, the organization's conservatism could result in their being rejected. Once a general capability system was defined and operational, the data and technological needs of many members could cause a shift in the R&D focus of the United States. Additional U.S. emphasis might begin to be placed on the international development of services and applications so that the overall level of U.S. "contributions" to the organization could remain optimal.

5. The Role of Non-Participating Nations and Nations Without Space Capability

An international meteorological satellite organization based on the INTELSAT model would offer both industrialized and developing nations a role in the development and management of an operational satellite system. Wide representation in the organization would also help meet the desire of many developing countries to benefit from the technological and scientific wealth of the industrialized world, and to have specific and individual needs recognized, addressed and resolved. As capability in satellite technology would be regarded as a contribution to the organization and its system, the role of members without either space or ground segment capability would not be on a par with countries that have such capabilities.

6. The Role of the Private Sector

An organization based on the INTELSAT model could operate with the direct participation of the private sector. Such a situation would closely resemble the COMSAT-INTELSAT arrangement, where the U.S. firm was created and designated by the Government to act as its operating entity. A similar entity could be created, or the Government could choose an already existing firm to manage operational activities. Any international concerns over the participation of a commercial firm in the traditional collection

and exchange of international meteorological data presumably would have to be allayed through Government oversight.

7. Feasibility of Implementation

To create such an organization would require the establishment of a new body through international agreement and the approval of the participatory governments. Interim and definitive agreements could be arranged for and entered into force following a schedule that would allow the current system of international exchange of meteorological data to continue unhindered. Such a process would take a number of years to complete.

VI. CONCLUSIONS

The purpose of this paper has been to discuss the issues involved in establishing an international meteorological satellite system and to offer possible institutional arrangements to support such a system. The intent has not been to identify any specific course of action that should be followed to provide continuity of satellite data. The preceding discussion has served to illustrate that there exist numerous international arrangements, both formal and informal, that could be modified to support an international meteorological satellite system. Increased international cooperation/coordination is a feasible method to ensure the long-term continuity of satellite weather data.

The models described in this paper range from retaining the status quo to creating a U.N.-like international organization. Both extremes have deficiencies that militate against their selection. The former exposes users of meteorological data to disruptions caused by unilateral national actions. Enhanced international cooperation will likely require a more formal framework than has been accepted to date. The latter model is probably too cumbersome either to form or to manage.

In the near term, it appears that the most feasible approach is to strengthen existing informal mechanisms where appropriate. For example, when one country supplies equipment for flight on another country's satellite—particularly when the equipment is a part of the operational instrument complement, rather than an experimental system--each party requires assurance that the other will meet its obligations. In the longer term, it may be that, as countries are drawn more closely together through such arrangements, a formal international organization could evolve. It is not possible today, however, to predict its form, nor even to demonstrate that such an organization would be necessary, feasible, desirable, or cost-effective.

APPENDIX A

COORDINATION ON GEOSTATIONARY METEOROLOGICAL SATELLITES (CGMS)

1. Background

The first discussions directed toward coordination of nationally-operated remote sensing satellites began in September 1972, when representatives of the United States (NOAA), the European Space Research Organization (now the European Space Agency*) and Japan (Japanese Meteorological Agency) met to consider complementarity and compatibility among these agencies' planned geostationary meteorological satellites. This initial meeting led to the establishment of an informal, technical group known as the Coordination on Geostationary Meteorological Satellites (CGMS), through which program/project managers of agencies pursuing plans for such missions are able to discuss common interests relating to the design, operation and use of their spacecraft. The USSR and India also initiated development of geostationary meteorological satellites and joined CGMS in 1973 and 1978, respectively. CGMS was organized to develop technical recommendations which are not binding on satellite operators. CGMS has served as a forum through which national plans could be informally rationalized and harmonized to the point where participating agencies could, if they wished, pursue development of complementary and compatible space segments. As a result of CGMS, while the geostationary meteorological satellites remain

*In 1985 responsibility for the management of the European geostationary satellite will be transferred to the newly formed EUMETSAT organization.

independently designed and developed, they also meet common meteorological mission objectives and have produced certain compatible data products for users around the world.

2. Institutional Arrangement

Participation is limited to those countries which have initiated development of or are presently operating geostationary meteorological satellites. This includes the United States, the European Space Agency (ESA), India, and Japan, as operators, and the USSR as having initiated development. Because decisions made by CGMS participants are advisory in nature and are not binding on national authorities, no formal vote is taken; however, consensus must exist for formal CGMS recommendations.

The work of CGMS since 1973 has been carried out principally through two technical working groups which work closely together and meet simultaneously or jointly. One group, the Operations Working Group, is concerned with the operational aspects of the programs, especially data processing and dissemination, and reflects knowledge of user needs in identifying possible areas where commonality among planned systems would be of value to users worldwide. Matters such as compatible data formats, standard transmission frequencies, compatible data collection platform standards, and complementary orbits have been identified by this group. The second CGMS group, the System Engineering Working Group, has considered the technical feasibility of suggestions developed by the Operations Working Group and has then derived possible means of implementing those suggestions deemed to be both technically feasible and

cost-effective, and which are also likely implementable from the point of view of policy, cost, and schedule. The reports of these working groups are reviewed by the CGMS.

3. Management Arrangement

As with the Working Groups in CGMS, the discussions of senior officials are considered informal and technical and are non-binding on the participants. Management of member countries' satellite systems remains with national agencies. CGMS does not have management or administrative authority. Working group and CGMS meeting conclusions are taken back to the national agencies by each senior official who recommends adoption or implementation of only those items which are determined to be in each country's interest and which can be supported from the point of view of cost, schedule, and technical feasibility. Final acceptance of any recommendation is indicated by exchange of correspondence among program/project managers after formal approval is obtained at the appropriate level within the parent organization or nation. The results of each CGMS working group meeting, as well as the meetings of senior officials, have been compiled in the form of brief technical reports. This information also is contained in a consolidated report, updated periodically, which summarizes the technical results of CGMS meetings. ESA has served as the unofficial secretariat for CGMS. All of the participants share the work of preparing technical studies in support of the CGMS meetings.

4. Funding

CGMS, as an informal coordinating group, has no budget. All costs associated with a country's participation in CGMS are borne by the national agencies of each respective country choosing to participate. Because most of the geostationary meteorological satellites discussed in CGMS meetings have been in the early stages of development, no significant cost impact has resulted from those recommendations made by CGMS. The discussions have, however, resulted in "fine tuning" by participants of their plans in efforts to achieve compatibility and complementarity.

There has been some discussion of a proposal to share a back-up satellite designed to save money for all countries if compatibility and technical specifications can be agreed upon. In February 1982, two CGMS study groups reported on various technical aspects important to the consideration of a common geostationary back-up satellite. As a result, the ESA delegation took the responsibility to formulate telemetry, command and frequency management parameters. The U.S. delegation took the responsibility to formulate imaging parameters required for a common satellite. The recommended parameters developed by ESA and the United States serve as the basis for continuing discussions on this issue. Thus far, discussions of a shared back-up satellite have not gone beyond technical considerations. Policy questions, such as mechanisms for cost sharing, procurement, and deployment criteria, have not been addressed and ultimately would involve a higher level of national coordination.

Some suggest that the development of compatible national systems would allow for international back-up even if no back-up satellite were to be procured. Once full compatibility is achieved, it would be technically feasible for one nation to assist another by reactivating and moving partially operable satellites to serve temporarily coverage areas lost due to a satellite failure. Full satellite system compatibility, however, is at least a decade away. This means that construction and implementation of a common back-up satellite, or any other kind of back-up arrangement will probably not occur before the year 2000.

APPENDIX B

WORLD METEOROLOGICAL ORGANIZATION (WMO)

1. Background

In spirit, the World Meteorological Organization (WMO) was born at an international conference at Brussels in 1853. The conference was held to meet the heightened awareness during the expansion of maritime commerce, arising from the Industrial Revolution, of the benefits of improved knowledge of winds, storms, and ocean currents to safety and economy of ocean travel. The First International Meteorological Congress, held in Vienna in 1873, established a permanent body for international cooperation comprised of directors of national meteorological services.

Under Article 57 of the U.N. Charter, the International Meteorological Organization (IMO) became the WMO in 1947. Specifically, the new organization was initiated by the "Convention of the World Meteorological Organization" on October 11, 1947. More than forty countries became original signatories, and the Convention entered into force on March 23, 1950. Today, there are 157 members, consisting of 152 nations and five territories (See Table A).

The WMO was organized:

(a) To facilitate worldwide cooperation in the establishment of networks of stations for the making of meteorological observations as well as hydrological and other geophysical observations related to meteorology, and to promote the establishment and maintenance of centers charged with the provision of meteorological and related services,

MEMBERS OF THE WORLD METEOROLOGICAL ORGANIZATION*

STATES (152)

Afghanistan
Albania
Algeria
Angola
Argentina
Australia
Austria
Bahamas
Bahrain
Bangladesh
Barbados
Belgium
Belize
Benin
Bolivia
Botswana
Brazil
Bulgaria
Burma
Burundi
Byelorussian S.S.R.
Canada
Cape Verde
Central African Republic
Chad
Chile
China
Colombia
Comoros
Congo
Costa Rica
Cuba
Cyprus
Czechoslovakia
Democratic Kampuchea
Democratic People's Republic of Korea
Democratic Yemen
Denmark
Djibouti
Dominica
Dominican Republic
Ecuador
Egypt
El Salvador
Ethiopia
Fiji
Finland
France
Gabon
Gambia, the
German Democratic Rep.
Germany, Fed. Rep. of
Ghana
Greece
Guatemala
Guinea
Guinea-Bissau
Guyana
Haiti
Honduras
Hungary
Iceland
India
Indonesia
Iran, Islamic Rep. of
Iraq
Ireland
Israel
Italy
Ivory Coast
Jamaica
Japan
Jordan
Kenya
Kuwait
Lao People's Dem. Rep.
Lebanon
Lesotho
Liberia
Libyan Arab Jamahiriya
Luxembourg
Madagascar
Malawi
Malaysia
Maldives
Mali
Malta
Mauritania
Mauritius
Mexico
Mongolia
Morocco
Mozambique
Nepal
Netherlands
New Zealand
Nicaragua
Niger
Nigeria
Norway
Oman
Pakistan
Panama
Papua New Guinea
Paraguay
Peru
Philippines
Poland
Portugal
Qatar
Republic of Korea
Romania
Rwanda
Saint Lucia
Sao Tome and Principe
Saudi Arabia
Senegal
Seychelles
Sierra Leone
Singapore
Somalia
South Africa†
Spain
Sri Lanka
Sudan
Suriname
Swaziland
Sweden
Switzerland
Syrian Arab Republic
Thailand
Togo
Trinidad and Tobago
Tunisia
Turkey
Uganda
Ukrainian S.S.R.
Union of Soviet Socialist Republics
United Kingdom of Great Britain and Northern Ireland
United Rep. of Cameroon
United Rep. of Tanzania
United States of America
Upper Volta
Uruguay
Vanuatu
Venezuela
Viet Nam
Yemen
Yugoslavia
Zaire
Zambia
Zimbabwe

TERRITORIES (3)

British Caribbean Territories
French Polynesia
Hong Kong
Netherlands Antilles
New Caledonia

† Suspended by Resolution 38 (Cg-VII) from exercising its rights and enjoying its privileges as a Member of WMO.

* On 1 May 1983.

(b) To provide the establishment and maintenance of systems for the rapid exchange of meteorological and related information,

(c) To promote standardization of meteorological and related observations and to ensure the uniform publication of observations and statistics,

(d) To further the application of meteorology to aviation, shipping, water problems, agriculture and other human activities, and

(e) To encourage research and training in meteorology and, as appropriate, in related fields and to assist in coordinating the international aspects of such research and training.

Thus, the creation of the WMO signified an international effort to coordinate, standardize, as well as encourage, developments in the field of meteorological services.

2. Organizational Arrangement

The Convention of the World Meteorological Organization created five bodies: the Congress, the Executive Committee (renamed the Executive Council in June 1983), Regional Associations, Technical Commissions, and the Secretariat. The plenary body of the WMO is the Congress, composed of delegates representing all members, each member having one vote. The primary duties of the Congress are: to determine general policies which fulfill the purposes of the Organization, to make recommendations to Members on matters concerned with these purposes, to refer these matters to appropriate bodies of the organization for action, to determine regulations on procedures for the various bodies, to consider reports and activities of the Executive Council and to take appropriate action in regard thereto, and to establish Regional Associations, Technical Commissions, and any additional bodies it deems necessary.

The Congress also elects the President and three Vice-Presidents of the Organization, as well as members of the Executive Council other than the Presidents of the Regional Associations. These duties are addressed at each session of Congress, which are held once every four years. The Congress also determines the maximum budget expenditures which may be incurred by the WMO.

Any question or dispute concerning the interpretation or applications of WMO regulations which occurs between sessions of the Congress is resolved through the Executive Council. The Executive Council is composed of the President and the three Vice-Presidents, the Presidents of Regional Associations, and 26 members-at-large. These 26 members-at-large do not represent their own countries, but rather represent the world consensus. They are chosen in a proportion related to the number of countries contained in each region within the WMO. Each Member has one vote. As the executive body of the WMO, the Executive Council is responsible to the Congress for the coordination of the Organization's program and for the utilization of its budgetary resources, based on decisions by Congress. The Executive Council can also provide technical information and assistance in the WMO's field of activities and, when necessary, take action on behalf of the Organization on resolutions and recommendations of Regional Associations and Technical Commissions. The Council also studies and makes recommendations on any matter affecting international meteorology and related activities of the Organization. It must report on its activities to each session of Congress and is responsible for preparing the agenda for the Congressional session. The Council holds a meeting at least once per year.

The President of the WMO chairs the meetings and otherwise responds to Council functions when the Council is not in session.

The WMO has designated six separate regions of the world. Regional Associations are composed of Members whose meteorological networks extend into one of the six geographic regions. These Associations meet as often as necessary: to promote the execution of Congress and Executive Council resolutions in their respective Regions, to consider matters raised by the Council and to coordinate meteorological and related activities in their Regions. The Regional Associations may make recommendations to Congress and the Council. Technical Commissions may be established by Congress to study and make recommendations to Congress and the Executive Council. Members of the Commissions are technical experts in the fields of reference covered by the respective Commissions. At present there are eight Technical Commissions: the Aeronautical Meteorology Commission, Agricultural Meteorology Commission, Marine Meteorology Commission, Climatology Commission, Hydrology Commission, Basic Systems Commission, and Instruments and Methods of Observation Commission.

The Secretariat is headed by the Secretary-General appointed by the WMO Congress and has a technical and clerical staff as may be required for the work of the Organization. All matters of concern to Members of the WMO, such as amendments to WMO regulations, are communicated to Congress and the Council through the Secretary-General. (The Secretary-General may also propose such amendments). Generally, the Secretariat serves as the administrative, documention, secretarial, public relations, and information center of the Organization. It may also make technical studies as directed by Congress or the Council. There is at least one expert in the Secretariat

for each of the various WMO-related fields (e.g., climatology). However, as many WMO projects involve voluminous work, the Secretary-General may hire outside private contractors to assist in a project or may call on WMO member countries to coordinate a joint effort in completing the task. The Secretariat not only carries out these administrative and technical studies and prepares specialized publications, but also serves as a link among national meteorological services and with U.N. organizations and other international organizations in fields such as world food production, natural disasters, environmental protection, water resource planning, and transportation.

Any of the above constituent bodies may recommend the establishment of working groups. A body may also recommend the establishment of a joint working group between itself and one or more other constituent bodies. These working groups can only be established by a resolution of Congress or the Council and normally serve until the next session of Congress. The terms of reference of these groups are established by the constituent body. Recommendations of working groups have no status within the Organization until they have been approved by the responsible constituent body.

3. Funding

The Financial Regulations of the WMO govern the financial administration of the Organization. Estimates of maximum expenditures for a four-year period are prepared by the Secretary-General and submitted to the Executive Council for review. The Council reviews the budget and a report commenting on the budget is given to Congress. After consideration of estimates and recommendations, Congress votes on the maximum expenditures required for the WMO. This vote constitutes authorization to the Council to approve appropriations for each financial year of the four-year period.

An annual budget prepared by the Secretary-General is submitted at the regular meeting of the Council for approval for the following financial year. The appropriations approved constitute authorization to the Secretary-General to incur obligations and make payments for the purposes for which the appropriations were approved and up to the specified amounts.

The budget of the WMO is apportioned among all Members of the WMO in proportions determined by Congress. The WMO apportionment method is modeled on the U.N. system of funding, whereby a percentage of the WMO budget is contributed by each member nation. The greater share of funding for the Organization is received from the industrialized/developed countries. The U.S. contribution to the WMO budget is approximately 25% (See Table B). The funds provided in accordance with this formula constitute the WMO's General Fund. In addition to the General Fund, a Working Capital fund is established in an amount fixed by Congress and for purposes to be determined by the Executive Council. The monies for the Working Capital Fund are advanced by the WMO Members and are calculated by the Council in accordance with the scale of assessments for the apportionment of the expenses of the Organization. Income may be derived from investments of this Fund and trust funds. Reserve and special accounts may be established by the Secretary-General and are reported to the Council.

The Secretary-General may accept voluntary contributions, provided that the purposes for which the contributions are made are consistent with the policies, aims, and activities of the WMO. Any contributions which directly or indirectly involve additional financial liability for the Organization require the consent of Congress. In addition, several special funds and trust funds are administered by the WMO for use in extra-budgetary activities.

TABLE B

MEMBERS CONTRIBUTIONS TO WMO FOR FINANCIAL PERIOD 1980 - 1983

USA	24.5%
USSR	10.4%
UNITED KINGDOM	5.7%
FEDERAL REPUBLIC OF GERMANY	4.9%
FRANCE	4.9%
CHINA	3.9%
CANADA	2.7%
JAPAN	2.6%
ITALY	2.2%
INDIA	1.9%
AUSTRALIA	1.8%
ALL OTHERS	34.5%
	100.0%

One of the main sources of funding for these specialized ventures is the Voluntary Cooperation Fund used in the Voluntary Cooperation Program. Under this Program, members, through multinational agreements, provide assistance in education. The greater share of funding for the organization is received from the industrialized/developed countries. The U.S. contribution to the WMO budget is approximately 25% (See Table B). The funds provided in accordance with this formula constitute the WMO's General Fund.

In addition to the General Fund, a Working Capital fund is established in an amount fixed by Congress and for purposes to be determined by the Executive Council. The monies for the Working Capital Fund are advanced by the WMO Members and are calculated by the Council in accordance with the scale of assessments for the apportionment of the expenses of the Organization. Income may be derived from investments of this Fund and trust funds. Reserve and special accounts may be established by the Secretary-General which are reported to the Council.

The Secretary-General may accept voluntary contributions, provided that the purposes for which the contributions are made are consistent with the policies, aims, and activities of the WMO. Any contributions which directly or indirectly involve additional financial liability for the Organization require the consent of Congress. In addition, several special funds and trust funds are administered by the WMO for use in extra-budgetary activities. One of the main sources of funding for these specialized ventures is the Voluntary Cooperation Fund used in the Voluntary Cooperation Program. Under this Program, Members through multinational agreements provide

assistance in education, expert technical advice, and equipment. For example, an industrialized nation (such as the United States) may buy desired technical equipment (such as the Automatic Picture Transmission (APT) Systems that permit direct readout of satellite weather data used in operational forecasting and severe weather warning) and install the equipment in lesser developed countries (LDCs). Training is also given and, thereafter, the LDC operates the equipment as its own.

The United States has contributed $1.5M annually to the Voluntary Cooperation Program from 1969 through 1976, $2.0M annually from 1977 to 1979, and $2.3M annually for 1980 to 1982. The expected U.S. contribution for 1983 and 1984 is $2.3M per year. The contributions of other nations have totalled approximately $2.0M annually and are expected to be $1.7M in 1983 and 1984. Contributions have been in three categories: equipment and services (80%), financial contributions (10%), and education and training (10%).

Another program which enables the WMO to give much valuable assistance to developing countries is the Technical Cooperation Program. The main components of this activity are the participation of WMO in the U.N. Development Program and WMO's Voluntary Cooperation Program. The U.N. Development Program also contributes to WMO Training Centres and the strengthening of meteorological and hydrological services in individual countries. The Secretariat administers that part of the U.N. Development Program assigned to WMO. Other fund-in-trust arrangements which account for several large assistance projects are financed by various donor Members and thus expand the range and substance of WMO technical cooperation activities.

As WMO programs are funded through the budget contributions made by Members and through arrangements such as the Voluntary Cooperation Program, no other charges are made to Members for WMO services except charges for WMO publications. These publications are available at a near-production cost to Members. Non-members are charged a slightly higher price. Non-members may also receive some assistance in WMO services; however, this assistance is available only if sponsored through a WMO Member.

APPENDIX C

NORTH ATLANTIC OCEAN STATIONS (NAOS)

1. Background

The North Atlantic Ocean Stations (NAOS) is a joint arrangement among various nations in support of ocean weather ships located throughout the North Atlantic Ocean region. This international effort in marine meteorology can be traced back to the first half of the 19th century, when merchant ships of most of the then maritime nations started making meteorological observations in oceans. The weather ship network, now formally known as NAOS, originated in 1948 for aviation purposes. The post-World War II era brought a large number of aircraft flying across the Atlantic which were in need of meteorological information for safety and economy. Under a scheme planned by the International Civil Aviation Organization (ICAO), a network of 13 ocean stations was set up in the North Atlantic. A formal Agreement on North Atlantic Oceans Stations was concluded in 1954.

These stations were operated by either the United States, Canada, or European nations (some stations were operated jointly by one or more nations). The stations provided communications, electronic navigational aids and rescue facilities for transatlantic aircraft, in addition to making regular surface and upper-air meteorological and oceanographic observations. The ships were operated and/or paid for jointly by all the countries which flew civil aircraft over the ocean.

In 1975, the ICAO discontinued its coordination of the ocean stations network as it was felt that civil aircraft crossing the North Atlantic no longer needed navigational communications or air/sea rescue aid from the

weather ships. Despite the information from satellites now available, it was felt that meteorologists still needed the regular surface and upper-air data from weather ships to contribute their part in ensuring the safety and economic operation of aviation, shipping, and other weather-sensitive activities. A modified weather ship scheme was continued under the coordination of the WMO. The network under the WMO was reduced to four ocean stations. The United States had already withdrawn from the agreement due to the expense of participation and presently acts only as an observer to the program.

2. Organizational Arrangement

The present NAOS system is now organized under the terms agreed to in the WMO's Agreement for Joint Financing of North Atlantic Stations, signed on November 15, 1974, by the governments of various Members of the WMO. Only those WMO Members who signed the Agreement for Joint Financing are members of the NAOS arrangement. NAOS is established loosely under the auspices of the WMO as an administrative system to facilitate coordinated funding and administration of four ocean stations in the North Atlantic.

The Agreement is administered by the NAOS Board which is composed of representatives of each contracting party to the Agreement. Each contracting party has one vote. The WMO Secretary-General can attend Board Sessions, convened yearly as required, but only in an advisory capacity. The Board's functions include reviewing and ensuring that the network operates with all possible economy, coordinating the work program of the stations, approving new major capital costs and other capital costs (including

new equipment) not exceeding the equivalent of $100,000/vessel/financial year, and examining and accepting the budgetary estimates and annual financial accounts. The Board may also establish, from its members, committees and working groups to carry out assigned tasks. Board decisions go into force immediately unless otherwise stipulated. The Agreement also allows for arbitration should any dispute between contracting parties arise out of the interpretation of the Agreement or its annexes.

The Board elects from its members a President and a Vice-President. The President directs activities of the Board, such as conducting their meeting and establishing an agenda for a Board session. In relation to the WMO, the Board must take into account the program and policies of the Organization. The WMO Secretary-General, is in a consultant position with NAOS, such as assisting the NAOS Board President with establishing a session agenda. In addition, budget estimates from operating parties of the Agreement are submitted to the Secretary-General, who then convenes the Board to present the operating parties' budget, as well as the WMO's budgetary estimate of costs for its own administrative support to NAOS.

The obligations of the contracting parties are to either finance or to provide, maintain, operate and finance vessels at stations in the North Atlantic. Those parties which actually operate the vessels are obligated to perform services as specified in the Agreement. The primary services under the Agreement include the taking of meteorological observations such as surface, upper wind, upper-air pressure, temperature and humidity observations. Secondary services include receiving and retransmitting meteorological reports

from other ocean stations and relaying to coastal radio stations reports of meteorological observations from merchant ships. The vessels are also used for rescue activities, and recently have participated in monitoring pollutant levels. Those parties to the NAOS agreement which do not actually provide ships or ship services are obliged to contribute funds which help to support operation of the system.

The four North Atlantic stations presently in existence are: the "L" station (57°00'N, 20°00'W) operated by one United Kingdom ship and one Netherlands ship, the "M" station (66°00'N, 02°00'E) operated by a Norwegian ship, the "R" station (47°00'N, 17°00'W) consisting of two French ships, and the "C" station (52°45'N, 35°30'W) consisting of three USSR ships.

3. Funding

The operating parties of the Agreement are reimbursed at the rate of 90% of the operating costs incurred by them in providing the required services. An annex to the Agreement provides a listing of the various recoverable costs, such as crew salaries, fuel, provisions, operational fees (such as harbor dues and liability insurance), as well as maintenance and overhaul.

Operating parties may also recover their capital costs approved by the Board from the contracting parties on the basis of recovery, assessed in accordance with annuity tables and the rate of the interest prevailing in their country at the date of the investment for financing similar government projects. The operating parties must declare their entitlement to the recovery of capital costs in accordance with the method prescribed

in the relevant Annex to the Agreement. This method includes any base capital investment (such as payment to a shipping company operating the ship on behalf of the government), vessel capital investment, as well as depreciation and interest percentages in both categories.

Reimbursement or payment to operating parties is made from contributions from the contracting parties to the Agreement. The scale of contributions is determined by a formula based on two conceptual factors: the "ability to pay" of each party to the Agreement and the relative "meteorological benefit" derived from the meteorological observations made at the stations.

There are three measures of the "ability to pay" of a party: the national income as presented in "National Income Data and Related Statistics," prepared by the United Nations, the number of WMO units, and the annual contribution to the United Nations. There are seven measures used to determine "meteorological benefit" derived by the party. These measures include factors such as the distance the party is from the center of the station network, and use of latitudes and longitudes of the stations to define the network center. An equation taking into account these seven measures is defined in an annex to the Agreement, and this formula is used for all contracting parties.

In addition, the scale of contribution of each contracting party is defined in percentages by combining the three ability-to-pay factors with the seven meteorological benefit factors. This combination of contribution possibilities is further defined in the Agreement annex.

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Ultimately, a percentage of contribution is determined for each contracting party with credits given to those contracting parties who are also operating parties. The numerical values of the ability-to-pay factors, which are used for computing the scale of contributions, are reviewed by the Board every three years or each time the number of contracting parties is modified.

Each year, the WMO renders a statement of account to the contracting parties indicating their obligations to pay and rights to receive cash in the following financial year. This accounting includes percentages determined by the scale of contributions method, voluntary contributions accepted by the Board, the purposes of which must be consistent with the policies, aims, and activities of the NAOS system, and costs of the WMO in administering the Agreement, including one regular session of the Board.

The NAOS, as explained, is dependent on contributions by the parties to the NAOS Agreement for its operating expenditures. Non-members can use the data products and are not charged for such use. No revenues are collected from the meteorological observations the NAOS network gathers. In fact, obtaining revenues from these observations is quite impossible due to the fact that the data are funneled into the Global Telecommunications System (GTS) explained below, whereby the data are publicly available free of charge.

APPENDIX D

GLOBAL TELECOMMUNICATIONS SYSTEM (GTS)

1. Background

The Global Telecommunications System (GTS) was initiated as part of the World Weather Watch (WWW) program of the WMO. The WWW is a worldwide meteorological system composed of the coordinated national facilities and services provided by individual Members and supplemented by regional and international organizations. Its primary purpose is to ensure that all Members obtain the meteorological observations and processed data they require for both operational work and research in a timely, coordinated fashion. GTS, as part of the WWW, is the international communications system which utilizes global communication links for transmission of meteorological and environmental information. It improves overall efficiency of the WWW in obtaining and using data. The GTS system now includes 156 nations and territories. Each Member's weather facilities are a part of the GTS, which involves international circuits on the regional as well as global (inter-regional) level.

Although planned and coordinated through the Basic Systems Technical Commission of the WMO, the GTS depends on Member states for its success. Funds, equipment and continuing implementation activities necessary for GTS functions are all achieved through Member contributions. WMO budget allocations are limited only to planning and coordinating activities.

2. Organizational Arrangement

The purpose of the GTS is to provide the telecommunication facilities and arrangements for the rapid and reliable collection, exchange, and distribution of required observational data to meet the needs of WMO

Members for operational and research purposes. The GTS also gives telecommunication support for the implementation of other environmental programs as decided by the WMO Congress or the Executive Council insofar as its principal objective allows.

The system is divided into a three-tier system: global networks [inter-regional or Main Trunk Circuit (MTC)], regional meteorological telecommunication networks (international circuits between countries), and national meteorological telecommunication networks. There are six Regions within the regional network.

Furthermore, the GTS is internationally supported by the telecommunication functions of the following centers:

(a) World Meteorological Centers
(b) Regional Telecommunication Hubs
(c) Regional Meteorological Centers, as necessary, in accordance with regional agreements
(d) National Meteorological Centers

The national meteorological telecommunication network in each country consists of essential parts of the GTS in order to ensure the efficient and reliable operation of the system. Each Member is responsible for establishing reliable and efficient circuits between its National Meteorological Center (NMC) and observing stations so that observational reports are collected on time at the NMC. All of the GTS elements in each individual Member country are funded and maintained by that individual Member.

GTS coordination is by the WMO's Basic Systems Technical Commission through their Telecommunications Working Group. The Group is composed of a representative from each of the WMO's six regions. Meetings are held

for the purpose of assisting in the implementation of the WWW objectives and generally to pursue the goal of assuring the efficient operation of the GTS system, as controlled and maintained by individual Members.

3. Funding

There is no central funding mechanism for the GTS. Each segment of the GTS is funded and managed individually by the Member concerned, not the WMO (although the WMO does provide funding for GTS coordination activities). Members can share costs for the common circuits. For example, the cost of the circuit from the United States to Japan is shared by both countries concerned. Use of GTS for transmission of data is free of charge to benefit all Members on the GTS.

APPENDIX E

EUROPEAN ORGANIZATION FOR THE EXPLOITATION OF METEOROLOGICAL SATELLITES (EUMETSAT)

1. Background

In the late 1970s, the European Space Agency (ESA) initiated its first meteorological program known as METEOSAT. The first spacecraft, METEOSAT-1, was launched in November 1977 and positioned in a geostationary orbit over the European region. METEOSAT-2 was launched in June 1981. These satellites provide, on a regular basis, imagery using the visible, infrared, and the water vapor spectra for distribution to meteorological centers throughout Europe. Based on the experience gained from ESA's pre-operational program, European users requested that a fully operational system be developed. As ESA is a research agency, it was recognized by the European states that there existed no national or international organization which had both the mandate and the capability to provide this region with meteorological satellite data on an operational basis. Further, such a mandate was beyond the resources of any single European country. Among options considered was the creation of the commercial entity for this purpose. Although several European meteorological agencies are introducing cost recovery practices for specialized weather forecast services, the market for weather forecast services did not appear sufficient to support operation of a meteorological satellite system, and a new intergovernmental organization appeared to be required.

To this end, government representatives met in Paris on March 21-23, 1983, for the Intergovernmental Conference on an Operational European Meteorological Programme to endorse a Convention for the Establishment of a European Organization for the Exploitation of Meteorological Satellites (EUMETSAT). Following this session, twelve European countries (Belgium, France, Germany, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, and the United Kingdom) signed the EUMETSAT Convention at the Conference of Plenipotentiaries on May 24, 1983, and thus initiated the ratification process. The Convention will enter into force sixty days after the date on which states whose aggregate contributions, based on commitments made by the twelve endorsing states, amount to at least 80% of the total budget of the EUMETSAT programme have ratified the Convention. If after two years from the date the Convention was opened for signature (May 1983) the required number of states have not notified the Convention, those that have signed may establish EUMETSAT among themselves. It is expected that full ratification of the agreement will be achieved by mid-1985.

2. Institutional Arrangement

The Convention established EUMETSAT as a legal entity capable of acquiring its own assets and being a party to legal proceedings. Under the EUMETSAT program, there will be established a Council and a Director supported by a Secretariat. The Council will be composed of no more than two representatives from each Member State, one of whom should be from that

country's meteorological service. Each Member State has one vote. From its membership, the Council will chose a Chairman and Vice-Chairman for a term of two years. During that period, the Chairman is precluded from acting as a representative of a Member State. The Council will meet in an ordinary session at least once a year and may meet in extraordinary session at the request of the Chairman or one-third of the Member States. Subsidiary bodies and working groups may be established as deemed necessary by the Council.

Among its various responsibilities, the Council is empowered to:

- o Decide on the accession of states to EUMETSAT,
- o Approve the conclusion of agreements with Member States, non-Member States or international organizations,
- o Decide to dissolve EUMETSAT,
- o Adopt an annual budget,
- o Appoint the Director,
- o Define the operational specifications of the satellite system as well as products and services, and
- o Adopt amendments to the Convention.

The Director is responsible for the implementation of decisions taken by the Council and for the execution of the responsibilities of EUMETSAT. As the legal representative of EUMETSAT, the Director is empowered to sign agreements approved by the Council as well as contracts. In addition, the

Director will:

- o Ensure the proper functioning of EUMETSAT,
- o Receive the contributions from Member states,
- o Enter into commitments and incur expenditures,
- o Draft tender invitations and contracts,
- o Provide administrative and technical assistance for the Council and working groups,
- o Monitor and control the execution of contracts, and
- o Prepare and implement the budget of EUMETSAT.

The Director is supported by a Secretariat. The Council approves appointments and dismissals of senior staff, while other members are appointed and dismissed by the Director. The Director has authority over the Secretariat staff as a whole. No post in the Secretariat is reserved for individuals of a specific Member State; however, in recruiting employees, account is taken of the international character of EUMETSAT.

Under the Convention, non-European states are eligible for membership in EUMETSAT.

3. Management Arrangement

Under authority from the Council, the Director is responsible for the regular management of the EUMETSAT program. In light of its existing capabilities to construct, launch, and operate meteorological satellites, ESA will continue its current METEOSAT satellite development and operation activities, under contract to EUMETSAT. The Director and a relatively small

staff of EUMETSAT will provide management oversight, consistent with guidance provided by the Council, while the appropriate establishments in ESA will be responsible for day-to-day operations.

Since the Convention will not come into effect before mid-1985, ESA has developed internal arrangements for a pre-operational and operational system as a precursor to the EUMETSAT organization. With the launch of METEOSAT-2, the program was designated as a pre-operational system. Eight Member States (France, Germany, United Kingdom, Italy, Belgium, Switzerland, Sweden, Denmark) are contributing research and development funds for satellite development and operations. The pre-operational program and its funding will terminate on November 23, 1983. After November 23, METEOSAT-1 and 2 will be incorporated into the operational program. Though ESA will still manage this system, the funding for operations will be provided by the national meteorological services of those states planning to participate in EUMETSAT. It should be noted that States not members of ESA are eligible to join EUMETSAT, as is the case with Turkey and Portugal. In addition to METEOSATS-1 and 2, METEOSAT-P2, ESA's second prototype, will be launched when required to provide data continuity until the first of the next series of satellites is ready for launch in 1987. Funds to launch P2 will come from ESA's pre-operational Meteosat budget while funding for P2 operations will be available through the operational budget.

Beyond ESA's pre-operational system, EUMETSAT's first operational program will consist of three improved METEOSAT flight models and one spare. The first satellite is scheduled for launch in 1987, followed by a second launch in 1988 and a third in 1990. Together, the ESA pre-operational program, and the EUMETSAT program will provide, in principle, satellite meteorological data from 1983-1995. The satellites will provide imagery in the visible, infrared and infrared water vapor spectral regions; disseminate images and other data in digital or analog form to user stations; and collect and disseminate data from in-situ Earth platforms.

The ground segment of EUMETSAT will be responsible for spacecraft operation as well as the reception and preprocessing of image data. Preprocessed images will be disseminated to primary data user stations (PDUS) and secondary (SDUS) data user stations. Other responsibilities include:

- o Dissemination of images from other meteorological satellites,
- o Acquisition and limited processing of data acquired through the spacecraft data collection system (DCS),
- o Dissemination of data to the WMO's Global Telecommunications System (GTS),
- o Extraction of quantitative meteorological data, including wind vectors, data needed for operational meteorology, such as sea surface temperature, and data suitable for climatological purposes,

- o Archiving digital data and photographic imagery, and
- o Production and distribution of documentation such as image catalogs and system user guides.

4. Funding

Under the first operational program (1983-1995), it is estimated that the EUMETSAT system will require 400 Million Accounting Units (MAU) ($400m). 378 MAU ($378m) for ESA support (satellite construction, launch, and operation); 10 MAU ($10m) for the EUMETSAT Secretariat (1985-1995); and 12 MAU ($12m) for other expenses incurred by EUMETSAT. Based on these projections, the twelve states which endorsed the Convention in May 1983 have agreed to the following schedule of contributions:

France 22%*	Belgium 4%*	Norway .5%*
Germany 21%*	Netherlands 3%*	Portugal .3%
United Kingdom 14.4%*	Switzerland 2.6%*	
Italy 11%*	Sweden .93%*	
Spain 4.5%*	Turkey .8%	

The percentage contributions were, for the most part, determined independently by the individual states. However, to some extent, funding commitments reflect the level of interest of these states in establishing EUMETSAT and the degree of support provided in the past for the experimental and pre-operational METEOSAT programs. It should be noted also that, although there are no provisions in the convention governing industrial return on investment, companies of the top six funding states are the principal contractors for constructing the operational satellites. Aerospatiale of France is the prime contractor. Ford Aerospace, a U.S. firm, will be retained on a consulting basis.

*Note: ESA Member-State

These contributions represent minimum commitments and may be revised depending on the final number of States that ratify the Convention. Expenditures will be covered by these contributions, other EUMETSAT income and voluntary contributions. The sale of meteorological data is not provided for in the Convention; however, there is nothing in this agreement which precludes such a possibility.

APPENDIX F

EUROPEAN TELECOMMUNICATIONS SATELLITE ORGANIZATION (EUTELSAT)

1. Background

During the late 1970's, Europe became more involved in satellite communications technology. The experimental Symphonie system, developed by France and Germany, and ESA's Orbital Test Satellite (OTS) demonstrated the utility of an operational regional telecommunications system. Since such a system was beyond the resources of any one nation and ESA--primarily an R&D and space science organization--did not have the mandate and was ill-equipped to manage an operational system, 17 members of the European Conference of Postal and Telecommunications Administrations (CEPT) established in June 1977 the "Interim" European Telecommunications Satellite Organization (EUTELSAT). This organization was modeled after the global telecommunications organization known as INTELSAT.

The interim organization was created to establish the framework for a follow-on operational entity. Its tasks included the development of technical standards for ground stations, establishment of traffic monitoring systems, creation of operational standards to ensure an efficient telecommunications system, and development of technical requirements for the planned European Communications Satellite (ECS) program. Twenty European countries belong to Interim EUTELSAT.

July 15, 1982, the Convention for Establishment of the European Telecommunications Satellite Organization (EUTELSAT) was opened for ratification. Today, 15 of the potential 25 countries of the CEPT have signed the Convention. It is expected that the agreement will come into force by January 15, 1984, or sooner, whenever two thirds of the potential CEPT countries sign.

2. Institutional Arrangement

EUTELSAT, once officially established, will be a legal entity enjoying the same privileges and immunities as other international organizations. Under the Convention, there are three main organs of EUTELSAT--the Assembly of Parties, the Board of Signatories, and an Executive Organ. The Assembly of Parties consists of those States signatory to the EUTELSAT Convention and is responsible for setting general policy objectives for the organization. It also deals with all questions concerning relations with outside bodies and recommenda-tions of the Board of Signatories. Each party has one vote in the Assembly.

The Board of Signatories represents those States or telecommunications entities which have signed the Operating Agreement. The Board is responsible for the adoption of policies, plans, and procedures for the design, development, acquisition and operation of the space segment; approval of procurement contracts; appointment of the Director General; and adoption of general financial and administrative procedures. The Board is also responsible for budget approval and fixing rates for utilization of the space segment. Each Board member has a voting participation equal to its investment share; however, no member shall have more than 20 percent of the total vote.

The Executive Organ, headed by a Director General appointed by the Board of Signatories, acts under the direction of the Board for the operation of the EUTELSAT system. The Director General acts as the chief executive and legal representative of EUTELSAT. The Executive Organ is responsible for tests, operations, system studies, finance and accounting, and personnel and general services. The Director General negotiates and, in

some cases, concludes contracts. For contracts exceeding 150,000 ECUs in value, Board approval is required. The EUTELSAT Convention specifies that goods and services will be procured through open international bids. However, when all factors are equal, contracts will be "awarded with due consideration to the general and industrial interests of the parties."

Management Arrangement

Over the next ten years, ESA is committed to developing five ECS spacecraft for EUTELSAT. EUTELSAT will own or lease the ECS space segment from ESA once the satellites have been tested in orbit. EUTELSAT, however, will be responsible for the day-to-day management of the entire system. The only ground facilities owned by EUTELSAT will be its System Control Centre and two monitoring stations, with the individual countries maintaining their own Earth stations.

4. Funding

Initial contributions (investment shares) will provide working capital for EUTELSAT. Once the system is operating, income will take the form of payments from national communications authorities based on the level of use of the system. Over the next ten years, the entire EUTELSAT program (satellites, launch services, and operations) will cost approximately 68 MAU ($68m). This exceedingly low figure does not reflect the subsidies provided by individual countries.

APPENDIX G

INTERNATIONAL TELECOMMUNICATIONS SATELLITE ORGANIZATION (INTELSAT)

1. Background

INTELSAT currently provides global public telecommunications services to the international community through the ownership and operation of a complex space segment composed of satellites and supporting ground command, control, and tracking facilities. In contrast, the Earth stations receiving transmissions from INTELSAT satellites are neither owned nor operated by the INTELSAT Organization, but are wholly controlled by the numerous national telecommunications entities participating in the INTELSAT system. Besides the standard international routing of telecommunications between INTELSAT members and other national users of the system, INTELSAT satellites also provide communication capacity for a number of national domestic services.

INTELSAT is the largest civil buyer and operator of satellites in the world. As of August 1983, the Organization's space segment consisted of a total of 16 INTELSAT IV, IV-A and V telecommunications satellites stationed in geosynchronous orbit over the Atlantic, Pacific and Indian Oceans. The first two of a series of INTELSAT VI spacecraft are scheduled to be orbited in 1986.

Early experience with satellites such as Echo I (1960) and the American Telephone and Telegraph Company's (AT&T) TELSTAR (1962) indicated great technical and commercial promise for satellite telecommunication. The Eisenhower Administration promoted this potential by directing the National

Aeronautics and Space Administration (NASA) to take the lead in satellite telecommunications research and development, and also to encourage private industry to develop the civil commercial use of this new technology. Several firms had already expressed interest in, and ideas for, satellite communications; however, AT&T's unique position as the only international telephone common carrier and its willingness to take on satellite communications R&D made it the prime candidate for collaboration with NASA. By 1960, AT&T was requesting clarification of NASA policy for assistance to companies considering concerted R&D, and was in the process of discussing plans for the provision of transatlantic telecommunication with the governments of France, Britain, and Germany.

The Kennedy Administration also recognized the promise of satellite telecommunications, and envisioned U.S. technological competence in this new field as a means of enhancing American prestige and national security. As a result, an additional $10m was added to the 1961 NASA budget expressly for the development of communication satellite technology.

At the same time, Congressional discussions considered the institutional and financial framework in which commercial satellite communications could develop so as to benefit both the United States and the international community. Generally, it was felt that such a commercial system would enable the United States and other countries to increase the capacity of existing international communications networks, and allow the growth in

volume of global public correspondence. Also of prime consideration was the fact that a commercial system would make direct access to the rest of the world feasible for most developing countries. Ultimately, H.R. 11040 was enacted by the Senate and the House of Representatives as the Communications Satellite Act of 1962 (P.L. 87-624). The Act's purpose was to provide for the establishment and government regulation of a private corporation--called the Communications Satellite Corporation (COMSAT)--which would be the U.S. participant in a commercial satellite telecommunication system. COMSAT was unique in that private ownership was effected through the issuance of stock to telecommunications carriers and the general public; yet Government oversight was created through the institution of regulatory controls by the Federal Communications Commission (FCC) and the Department of State, and the Presidential appointment of several corporate board members.

The Communications Satellite Act stipulated that the U.S. commercial system was to be established in cooperation and conjunction with other interested nations, and would be a part of an improved global communications network. Initially, COMSAT promoted the concept of an international system based on a series of bilateral agreements or the lease of American-owned circuits. However, the State Department advocated a more flexible multilateral arrangement in order to encourage foreign ownership and use of the system. COMSAT and the Government began to prepare for the establishment of an international organization to develop and manage a global telecommunications network.

Arrangements for a commercial satellite association were subsequently discussed at an International Telecommunications Union (ITU) conference in October of 1963, and by July of 1964 negotiating nations were agreed on the Interim Arrangements for a Global Commercial Communications Satellite System. On August 20, 1964, the International Telecommunications Satellite Consortium (INTELSAT) was established to operate for five years under the Interim Arrangements, after which time a set of Definitive Arrangements would be negotiated.

The Interim Arrangements established the Interim Communications Satellite Committee (ICSC) to govern INTELSAT policy regarding the development and operation of the system's space segment. Investment in INTELSAT was opened to all members of the ITU wishing to share the costs of designing, establishing, and operating the system. Use of the system was to be open to all nations, with the only requirement being payment for actual usage of system capabilities. Votes in the ICSC corresponded to the degree of INTELSAT owners' share of the system; in turn, shares were determined according to the system's projected use by the signatories. Based on expected U.S. usage, COMSAT received 61 percent of the Consortium's voting power.

In 1969, formal discussions on the development of Definitive Arrangements were initiated at the Plenipotentiary Conference on Definitive Arrangements for the International Telecommunications

Satellite Consortium. The Conference met periodically until 1971, progressively formulating an agreement acceptable to Member States. By May 1971, a permanent agreement proposing a substantive reordering of the organization was open for signature. The Definitive Agreements entered into force February 12, 1973. Two interrelated documents make up INTELSAT's Definitive Agreements; the Agreement... and the Operating Agreement..., both Relating to the International Telecommunications Satellite Organization "INTELSAT." The Agreement was concluded among participating Member States, and the Operating Agreement may be signed either by a state wishing to become a Member or a public or private telecommunications entity designated by a Member State to participate in the Organization.

2. Institutional Arrangement

INTELSAT membership is open to any state that is a member of the ITU. Most parties to INTELSAT are represented by their governments or by publicly controlled communications organizations directly responsible to their governments (Table A). Access to and use of the satellite system is also available to all non-signatory nations throughout the world. Yugoslavia is the only Communist member country. A number of Eastern European and other Communist nations participate jointly in the Soviet-managed INTERSPUTNIK satellite telecommunications system. In April 1983, there were 410 Earth stations in 141 countries and territories of the three regions of the INTELSAT system, with a total of 493 antennas receiving transmissions from INTELSAT satellites.

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INTELSAT operates under the management of four functional organs: an Assembly of Parties, a Meeting of Signatories, a Board of Governors, and an Executive Organ.

The Assembly of Parties is composed of government representatives of all states party to the Agreement. The Assembly meets every two years to consider aspects of INTELSAT organization management that are primarily of interest to nations as sovereign states; to formulate organizational policies and long-term objectives; and deliberate on resolutions, recommendations or views put to it by the Meeting of Signatories or the Board of Governors (discussed below). One vote is accorded each party in the Assembly, and the decision of matters deemed substantive requires a two-thirds majority vote.

The Meeting of Signatories is composed of Operating Agreement signatory representatives having one vote each, and considers resolutions, recommendations or views put to it by the Assembly of Parties or the Board of Governors. It also considers financial, technical, and operational policies of the system. For example, the meeting decides upon Board of Governors recommendations concerning an increase in the capital investment ceiling; annually determines the minimum investment share needed for representation on the Board of Governors; and establishes rules, with the guidance of the Board of Governors, regarding the approval of Earth stations for access to the INTELSAT satellites, the allotment of satellite capacity, and the establishment and adjustment of INTELSAT satellite charges on a non-discriminatory basis.

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TABLE A

INTELSAT MEMBER NATIONS

(AS OF FEBRUARY 1983)

Afghanistan
Algeria
Angola
Argentina
Australia
Austria
Bangladesh
Barbados
Belgium
Bolivia
Brazil
Cameroon
Canada
Cape Verde
Central African Republic
Chad
Chile
China, People's Rep. of
Colombia
Congo
Costa Rica
Cyprus
Denmark
Dominican Republic
Ecuador
Egypt
El Salvador
Ethiopia
Fiji
Finland
France
Gabon
Germany, Federal Rep. of
Ghana
Greece
Guatemala
Guinea
Haiti
Honduras
Iceland
India
Indonesia
Iran, Islamic Rep. of
Iraq
Ireland
Israel
Italy
Ivory Coast
Jamaica
Japan
Jordan
Kenya
Korea, Rep. of
Kuwait
Lebanon
Libya
Liechtenstein
Luxembourg
Madagascar
Malaysia
Mali
Mauritania
Mexico
Monaco
Morocco
Netherlands
New Zealand
Nicaragua
Niger
Nigeria
Norway
Oman
Pakistan
Panama
Paraguay
Peru
Philippines
Portugal
Qatar
Saudi Arabia
Senegal
Singapore
Somalia
South Africa
Spain
Sri lanka
Sudan
Sweden
Switzerland
Syria
Tanzania
Thailand
Trinidad and Tobago
Tunisia
Turkey
Uganda
United Arab Emirates
United Kingdom
United States of America
Upper Volta
Uruguay
Vatican City State
Venezuela
Vietnam
Yemen Arab Republic
Yugoslavia
Zaire
Zambia

The Board of Governors has replaced the functions of the interim Consoritum's ICSC. The board is composed of signatories that, individually or in groups, are major users of the INTELSAT system: approximately 20 members are represented, and up to five groups--corresponding to the five ITU regions--composed of at least five signatories from within the same ITU region may also be represented regardless of the size of their investment shares. The Board usually meets four or five times a year. The Board is responsible for all decisions concerned with the design, development, construction, establishment, operation, and maintenance of INTELSAT space segment functions. It is assisted in these responsibilities by an Advisory Committee on Planning, and a Budget and Accounts Review Committee. While in principle each governor on the Board has a vote equal to his member nation's investment share, no Governor may cast more than 40 percent of the total vote. The difference between individual investment shares represented and the 40 percent threshold is distributed equally among the other Governors. Decisions on substantive matters call either for the support of at least four governors representing two-thirds or more of the total investment shares, or the support of all but three Governors regardless of the total investment share which the large numerical majority may represent. There is no unilateral veto power accorded any signatory on the Board, as was the case with the United States under the Interim Agreements.

3. Management Arrangement

The Executive Organ is responsible to the Board of Governors for the performance of all functions relating to the management and operation of the INTELSAT system. The Executive is headed by a Director-General who acts as the organization's chief executive officer and represents--unlike the previous Consortium--the Organization's juridical personality to carry out legal functions (such as concluding international agreements, dealing with property, and being the INTELSAT party to legal proceedings).

4. Funding

The Definitive Agreements provide for INTELSAT organization ownership of the space segment (under the Interim Agreements, the INTELSAT space segment was owned in shares by the signatories in proportion to their contributions to the cost of system design, development, construction, and establishment). INTELSAT sells its capacity to all satellite telecommunications users, and revenues thus received are shared out after expenses among the Member States. The members as users will have paid much of this total revenue, and the revenue individually contributed both establishes each Member's percentage shareholding in the Organization and determines Member contributions to overall capital investment in the system. Thus, usage and investment in the system are correlated; the percentage of actual system utilization determines financial interest through investment shares.

Each signatory's share must not be less than 0.05 percent. Also, there is no guaranteed minimum investment quota as there was under the Interim Agreements (where COMSAT was guaranteed a quota of no less than 50.6 percent).

There is continued growth in space segment investment: the INTELSAT VI spacecraft program may include up to 16 satellites, with current plans calling for the use of nine orbiting satellites. The estimated cost of the new system is U.S. $2.2 billion, and investment would be phased over the period 1982 to 1992. In 1981, INTELSAT's capital ceiling was raised from U.S. $1.2 million to U.S. $2.3 million, primarily to accommodate completion of the current satellite program and the first phase of the new INTELSAT VI series. In early 1983, 108 member countries held investment shares in the INTELSAT Organization, with owners' equity totalling approximately U.S. $860 million.

User demand for full-time INTELSAT voice, record and data services increased 24 percent in 1981. These system services accounted for approximately 85 percent of total satellite revenue received in that year, with the remaining 15 percent produced by the lease of transponders, providing facilities for occasional telecommunciation services, and other diverse system demands. Although there was a 7.1 percent reduction in system charges, in 1981 total revenues increased 15 percent over the previous year. In spite

of an inflation of space segment costs and operating expenses, during 1982 INTELSAT maintained all existing space segment charges at 1981 levels. The 1981 return on signatory capital was 14.5 percent, representing a cumulative return on capital of 16.1 percent since 1973 (versus the target average of 14 percent per annum).

REPORT

OF THE

GOVERNMENT TECHNICAL REVIEW PANEL

ON

INDUSTRY RESPONSES

ON

COMMERCIALIZATION OF CIVIL REMOTE SENSING SYSTEMS

Contents

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November 10, 1982

Report of the Government Technical Review Panel
on Industry Responses on Commercialization of
the Civil Remote Sensing Systems.

I. OVERVIEW

The panel convened on 26 October and reviewed fourteen responses to the Request for Information that appeared in the Commerce Business Daily (CBD) on September 10, 1982. No attempt was made to solicit additional information or clarification from respondents.

The responses varied in scope and sophistication from a handwritten postcard to a fairly comprehensive, all inclusive submission. Criteria for evaluation could not, therefore, be applied uniformly to all proposals. However, the following general criteria were used, as applicable:

(1) Responsiveness to federal needs;
(2) Continuity of data services;
(3) Feasibility; and
(4) National security and foreign policy concerns.

Responses were grouped into four (4) natural categories reflective of their basic thrust:

(1) Those favoring near-term commercialization of existing civil remote sensing capabilities, entirely or in part.
(2) Those espousing independent entrepreneurial interests and advocating a climate conducive to free market competition.
(3) Those favoring government retention of the existing system, at least for the immediate future.
(4) Other.

II. SUMMARY AND OBSERVATIONS

It could fairly be stated that a simple evaluation of responses to the RFI would fulfill the charter of this panel and that further comment is gratuitous. Nonetheless, our study of this issue and the responses produced a consensus which we would be remiss not to surface.

Insofar as the responses are positive toward the issue of commercialization, they tend to assert rather than demonstrate an ability to satisfy whatever criteria we might establish. Nonetheless, the panel harbors significant doubt as to whether all U.S. government interests could be satisfactorily protected if the approach is simply to substitute one monopolistic organization for another. Perhaps, it will take an RFP to answer the toughest questions.

The RFI elicited more interest than might have been expected and surfaced a strong body of opinion that urges restraint and caution in proceeding with commercialization. There is an underlying theme common to the submissions from several large, responsible, and knowledgeable entities that commercialization now could inhibit the free market process. They suggest continued government operation of the system while fostering an environment conducive to an expansion of free enterprise activities.

One of the concerns which permeated our discussions of a non-government monopoly environment, was the potential lack of vigor in the R&D effort and lack of incentive to adopt improvements which may materialize. This has been the case in the satellite communications field. It is our belief that the best answer to the emerging foreign competition lies in the continuation of a dynamic U.S. government R&D system.

It is also the belief of the panel that there is considerable financial, policy and program risk to the government in commercializing weather satellites and that there is no clear policy or financial benefit to be realized. Too, there is no clear consensus among the respondents as to the desirability or feasibility of commercializing any of our civil remote sensing systems at this time.

Additionally, creation of a single, government-chartered, subsidized firm for this purpose would seem antithetical to the underlying economic philosophy of the United States and, in particular, this Administration, as we understand it. If regulated, it would result in the creation of a "utility" without the competitive incentives for reducing operating costs or increasing efficiency. If unregulated, the chartered entity would tend to assume the characteristics of a legislated monopoly.

Finally, the following general national security concerns exist in commercialization of remote sensing from space even though not specifically addressed in the individual evaluations:

(1) There is some potential for military and intelligence application of current data products, and

(2) with possible system improvement under private sector control these concerns would increase.

(3) There are technology transfer issues which might be exacerbated if a private sector operator became the world wide supplier of remote sensing equipment and spares.

(4) Controls over data dissemination, and provision for DOD emergency use would require very careful stipulation in any transfer of civil remote sensing activities.

III. EVALUATION OF THE RESPONSES

1. CATEGORY ONE - Those favoring near-term commercialization of existing civil remote sensing capabilities, entirely or in part.

COMSAT, Environmental Satellite Data, Inc., and Control Data Corporation are willing to proceed now in assuming at least part of the existing land and/or weather satellite systems. COMSAT proposes to take over both systems in their entirety. Control Data Corporation proposes a phased take-over of the Landsat ground processing and distribution system, while Environmental Satellite Data, Inc. suggests operating specific segments of the GOES ground system. Although the magnitude of the private sector take-over varies substantially among these firms, sufficient details were provided to permit an evaluation under all four general criteria. A fourth respondent, the American Science and Technology Corporation, proposes to take over the command and control of the Landsat satellites. However, the thrust of this response focuses on new entrepreneurial interests and is therefore reported under Category 2.

A. Communications Satellite Corporation, Comsat General Corporation (COMSAT)

COMSAT has submitted the only proposal advocating total commercialization of civil remote sensing. Additionally, COMSAT emphasizes a 'concern for urgency' in such a transfer. While COMSAT presents the most detailed proposal (due to the magnitude of the transfer), it reiterates its earlier position of requiring both the civil weather and land remote sensing satellites to insure future commercial viability.

(1) Responsiveness to Federal Needs:

The COMSAT concept involves private sector purchase of the current assets in the government's land and civil weather systems. These would be enhanced in the future by incorporating additional sensors upon identification

of the specific user needs. The federal government would pay most of the incremental costs. For example, COMSAT suggests adding sensors that would collect oceanic data on water color, winds, ice, and wave conditions.

It is not clear that Landsat's coarse (80 meter) multispectral scanner data, which are used extensively for making agricultural assessments, would be included as part of the basic data collection package that COMSAT suggests for the post-Landsat D' era of the late 1980's. However, if this need is identified as a continuing federal user requirement, COMSAT would provide this capability, at additional cost, if it were not part of the projected array of imagery collection capabilities. Thus, from the viewpoint of system technical capabilities, this concept would be more than fully responsive to the current and future level of federal user requirements with reference to timeliness, extent and frequency of coverage, imagery characteristics and data formats, and timeliness.

However, the proposal would not appear to meet another critical user requirement -- assurance of data availability at reasonable cost. The COMSAT concept would require federal data purchases at an annual level of about $315-330 million per year. For the government to meet this amount, it appears that there will have to be either a substantial increase in the cost of land and/or weather data or there will be substantial direct subsidy payments to COMSAT.

Another factor that is less significant than either of the two preceding factors is the matter of proprietary rights. The COMSAT concept also calls for the system owner/operator to have copyright and proprietary rights over the data that are collected. Such rights, while desirable from the viewpoint of helping make the system self-financing, have the disadvantage of inhibiting the use of the collected data.

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(2) Continuity of Service:

Implementation of the COMSAT concept would appear to satisfy the major consideration of maintaining continuity of data flow. However, the concept does afford the system operator a loophole for (a) restricted liability only if the "best efforts" are not made, and (b) also for performance being contingent upon the federal government meeting extensive financial commitments for a 15 year period.

Should changes occur in the international price structure which adversely effect profitability, i.e., undercutting of U.S. commercial data prices by a foreign competitor, a commercial operator might elect to abandon the enterprise, or use the "best effort" principle to demand increased federal price subsidies.

(3) Feasibility

This proposal would replace existing weather ground systems, which need technical improvement, and would use current Landsat facilities and equipment. In addition, a centralized facility is proposed for both land and environmental data based on Landsat-type hardware. Centralization is technically valid, but does not exploit what is currently known about the advantage of distributed processing architecture, insofar as service to users is concerned i.e., throughput, availability, and accessibility of data. The proposed technology to be employed on COMSAT's LANDSTAR, the successor to LANDSAT, includes linear array focal planes and on-board data compression capability. These are needed improvements if high resolution solid-state sensors are adopted. Not mentioned, but very much needed on any follow-on sensor, is the addition of cooled focal planes for short-wave and thermal infrared data, and a capability of off-nadir pointing for more frequent coverage of the same scene. The addition of synthetic aperture radar sensors for data set merging is very appealing as is the integration of weather and land remote sensing systems for

more efficient programming of data acquisition and low-orbit collection of environmental data. COMSAT recognizes that guaranteed progress in technological advances and maintenance of U.S. technological leadership can only be realized if government retains an active role in advanced technology development, either alone or in some joint role with the operator of the systems.

(4) National Security and Foreign Policy Concerns:

The COMSAT proposal is based on a "best effort" principle which does not commit the Corporation to provide continuous services over the lifetime of the contract. A disruption of land remote sensing and weather services could have substantial foreign policy implications in terms of traditional U.S. international data exchange policies which emphasize continuity and non-discrimination.

COMSAT states its intentions to broaden the primary data market by limiting secondary reproduction and distribution of data. This could ultimately jeopardize the continuous and reciprocal international exchange of meteorological data upon which this country is vitally dependent.

If a national emergency required disruption of commercial service in Metsats and/or Landsats, the government would have to reimburse the commercial operator for lost revenues. This would entail an additional government expense not incurred under government ownership and would constitute an additional complicating factor in making national security and foreign policy decisions.

COMSAT proposes to sell "surplus" DCS (data collection system) capacity to commercial users which could be used for non-environmental purposes. However, by agreement in the International Telecommunications Union, (ITU), DCS frequencies are to be used exclusively for environmental monitoring.

No contractual or legislative stipulation should preclude the government from developing its own satellite systems for national security purposes.

B. Environmental Satellite Data, Inc., (ESD)

ESD does not address Landsat or the overall weather satellite system. Instead the company offers to assume responsibility for a small segment of the GOES data processing while focusing on the distribution of GOES imagery to commercial users. The proposal would terminate the current GOES-TAP "no-cost" service and replace it with a larger, more efficient system requiring a commercial user contractual fee. This concept could be implemented under existing policies and regulations.

(1) Responsiveness to Federal Needs:

Within the limited scope of this proposal ESD appears to satisfy federal needs and to be responsive to increasing numbers of users.

(2) Continuity of Service:

Phased implementation should assure continuity of service.

(3) Feasibility:

This proposal contains no technical detail, but it does assert that the VIRGS earth locating program can be improved to the point that one pixel location accuracy of the grid on the satellite imagery can be obtained within six hours after completion of maneuver of the satellite, vice 10 pixels and 24 hours. Since larger and faster computers than those currently used are available, this should be readily achievable. However, no conclusions on capability are possible without specifics on computers and data management.

(4) National Security and Foreign Policy Concerns:

ESD proposes to distribute only a small part of the total GOES weather satellite imagery. So long as any government agreement with ESD includes provision for equal, non-discriminatory access to data, no foreign policy issues are raised. No national security problems exist.

C. Control Data Corporation, CDC.

CDC proposes a time-phased, joint government/industry venture beginning with ground processing of Landsat data by 1984. This would lead to economic validation of a transition from a subsidized, government service operation to a product-based, profit making venture. The feasibility of transfer of the space segment for remote land sensing would be evaluated during the transition. Weather data could be included in such a ground data processing system.

(1) Responsiveness to Federal Needs:

CDC's joint venture concept could be designed to meet specific federal needs throughout the transition to private ownership and operation.

(2) Continuity of Service:

Not specifically addressed, but preceding comments are applicable.

(3) Feasibility:

CDC's stated experience with data processing and analysis and with DOD space systems would attribute to CDC a technical credibility sufficient to warrant serious consideration of their suggestions on commercialization. However, no details of a technical nature were provided. CDC's concept represents a conservative, low technical risk approach to eventual commercialization. CDC, along with COMSAT and Terra-Mar, explicitly recognizes the greatly improved information extraction potential in merged or "fused" data sets from different parts of the electromagnetic spectrum. CDC recognizes that technological progress can only be assured if the government maintains an active role in advanced technology development, either alone or in some joint role with the operator of the systems. The data provided on concepts for user services facilities illustrates at least a basic understanding of how such facilities should function in data processing, archiving, and distribution. The highly buffered system concept presented represents state-of-the-art thinking on high-rate, high-throughput, functional requirements.

(4) National Security and Foreign Policy Concerns:

CDC's concept does not pose a foreign policy concern if the suggested user service scheme satisfies present policies on data access and distribution, and if a discriminatory pricing system is not imposed. However, the response fails to address these issues. No national security concerns are raised.

2. CATEGORY TWO - Those espousing independent entrepreneurial interests and advocating a climate conducive to free market competition.

Three firms - Terra-Mar, American Science and Technology Corporation and Space Services, Inc. - advocate a free enterprise environment which permits a natural evolution and competitive development of the private sector remote sensing industry. Their premise is that successful commercialization will occur only in a competitive market where government regulations and guarantees are held to a minimum. System development would be driven by market forces and user requirements rather than technological capabilities. While Terra-Mar looks at the philosophy underlying the development of free-market remote sensing, AS&T and SSI outline their respective entrepreneurial concepts and future plans concerning satellite remote sensing, satellite launch and associated services.

A. Terra-Mar

Terra-Mar is developing an earth resources data service aimed primarily at commercial clients. The company's data service plan is based on extensive in-house market research. Terra-Mar states that the exploitable market in remote sensing is based on computer and information technology. They advocate an open market for data within the value-added industry. This company is concerned that the immediate transfer of the existing Landsat assets could be as much a hindrance to commercialization as a benefit, unless the government takes prudent steps to smooth a gradual transition to private operation. Terra-Mar is opposed to near-term transfer of weather satellites because of the vital nature of weather information in serving the national interest.

(1) Responsiveness to Federal Needs:

Not specifically addressed.

(2) Continuity of Service:

Not addressed.

(3) Feasibility:

No specific systems were recommended or discussed in detail. Comments regarding the desirability and feasibility of a distributed processing system, and the probable advance of computer technology are well within the current consensus of industry and government on this technology. The efficiencies of a distributed system regarding throughput and availability of data are recognized. In addition, a distributed system can provide many levels of complexity in analysis capability, which will permit superior tailoring of product and information extraction capabilities.

(4) National Security and Foreign Policy Concerns:

No concerns were noted.

B. American Science and Technology Corporation (AS&T)

AS&T proposes to take over command and control of Landsat-4 and D' while pursuing the development of their own remote sensing satellites. They do not plan to process or to distribute Landsat data, but will build their own ground segment to serve future AS&T space platforms. AS&T does not express any interest in civil weather satellite systems. Additionally, they do not believe further government regulation or legislation is required or necessary for the implementation of this proposal.

NOTE: AS&T has been working in conjunction with SSI in planning the launch of AS&T remote sensing satellites as early as 1984.

(1) Responsiveness to Federal Needs:

AS&T would assume operational control (not ownership) of Landsat-4 and Landsat D'. These satellites would be integrated with AS&T's own low-cost AEROS earth remote sensing satellites, which would provide complementary data. Thus, many user data needs, e.g., data format, compatibility, resolution, frequency of coverage, would be initially satisfied by the combined Landsat-AS&T system. AS&T's proposed flat fee for access to sensors and data flows is attractive, and on the surface, very cost competitive. However, data from non-U.S. areas would have to be relayed via TDRSS, or obtained from foreign ground stations -- with potentially high additional costs. Foreign coverage, lacking TDRSS capability and foreign stations, may prove inadequate.

The stable of sensors which AS&T proposes to build and launch by 1985 cannot, by themselves, satisfy current and projected federal requirements for multispectral data since the specifications do not include the spectral coverage or spectral resolutions required. Spatial resolutions which are comparable to Landsat do not solve the problem, since the large majority of analysis is with spectral, not spatial, information extraction.

(2) Continuity of Service:

Continuity of service appears to be assured, provided AS&T can maintain development, launch and operational schedules.

(3) Feasibility:

AS&T proposes the take-over of existing Landsat-4 ground subsystems relating to command, control, and maintenance of the health of the spacecraft. However, AS&T apparently does not possess the broad range of experience and expertise necessary to maintain highly complex spacecraft such as Landsat, nor is there a personnel and facility resource extant in AS&T upon which the company could rely in any spacecraft emergency.

Statements made previously by AS&T in public fora, but not included in this submittal, have alluded to probable costs of replacement or complementary sensors which are unrealistically low, in our estimation. Technical risks associated with space activities to be undertaken by companies new to this activity are very high, and translate directly into the necessity for large cash contingencies. In addition, the probability that complex sensors can be acquired, integrated, launched and checked out in three years is very low, as discussed in the comparable section on feasibility for SSI.

(4) National Security and Foreign Policy Concerns:

AS&T does not wish to pay for TDRSS. Unless the U.S. government continues to support TDRSS for Landsat, it is unlikely that a current Landsat global data base could be maintained for U.S. or foreign users. This has both national security and foreign policy implications.

The AS&T proposal raises the following additional foreign policy and national security concerns: (a) Possible assumption of U.S. foreign policy obligations by a private firm; and (b) Data distribution in a non-discriminatory manner to all customers.

C. Space Services Incorporated of America (SSI)

SSI is developing launch services for space activities and is not interested in the ownership or operation of Landsat, related data acquisition or data distribution. SSI believes land and weather satellites should not be considered simultaneously for transfer to private industry, and further that weather systems should not be commercialized at this time. SSI states that any transfer to private industry should not create a monopoly, but allow opportunity to compete in the free marketplace.

NOTE: SSI has been working in conjunction with AS&T in planning the launch of AS&T remote sensing satellites as early as 1984.

(1) Responsiveness to Federal Needs:

Not specifically addressed.

(2) Continuity of Service:

See AS&T proposal.

(3) Feasibility:

This proposal states an intent to launch private sensors as early as 1984 which would "complement" or "overlap" existing Landsat capabilities. The development and acquisition of free-flying space remote sensors typically take six to eight years. However, disregarding government delays and procedures, and assuming state-of-the-art technology, the fabrication, test, integration and launch might take three to five years given the most optimistic estimate. In addition, the inclusion of cooled focal planes aboard the sensor, which are important in geology and other space applications, are unlikely to be achieved in this time frame, thereby eliminating the majority of federal and other sophisticated users of thermal data. Lastly, SSI has not demonstrated a capability to launch a 1000-2000 Kg payload into orbit, nor does SSI appear to have the capability to command and control the spacecraft, check out on-board systems, or process sensor data. SSI makes the statement that it "supports the concept of allowing the private sector to use government facilities and equipment already in place." However, existing facilities and equipment can only be used by expert, experienced personnel with access to a very broad range of resources to solve problems, maintain system capabilities and provide continuity. SSI does not appear to possess these attributes.

(4) National Security and Foreign Policy Concerns:

SSI recognizes government responsibilities to authorize and supervise private remote sensing activities in accordance with the 1967 Outer Space Treaty and national security interests. However, there is concern whether further commercial space launch services, from within the U.S., be permitted until a well-defined national policy and regulatory framework dealing with such activities have been established and approved.

3. CATEGORY THREE - Those favoring government retention of the existing system, at least for the immediate future.

The University of Massachusetts, RCA, Hughes Aircraft, General Electric and Ocean Routes Inc., support continued government operation and ownership of the remote sensing system through the next ten years or more. They present alternatives that could lead to eventual commercialization of Landsat, but these involve extensive government participation through various management, joint-operator or financing options. These respondents are opposed to commercialization of the weather satellite programs, as well as the creation of any monopolistic commercial entity for land sensing. It should be noted that three of the nation's major aerospace industries (RCA, GE, and Hughes) share this basic position.

A. Remote Sensing Center, University of Massachusetts (UMass)

The UMass proposal is somewhat ambiguous but looks to an evolutionary, step-by-step approach leading toward commercialization. However, they believe the current systems would require extensive federal support if a transfer to private industry were attempted in the near-term. In the UMass plan, individual segments of the current systems would be modified and gradually replaced by the private sector until full commercialization of the land sensing system was achieved. They doubt that total private-sector ownership/operation of the weather sensing system is feasible now or in the foreseeable future.

(1) Responsiveness to Federal Needs:

Insufficient information is provided to permit an evaluation; however, a phased take-over should fulfill user needs initially.

(2) Continuity of Service:

Information provided is indeterminate for evaluation; comments in the preceding paragraphs apply.

(3) Feasibility:

The plan for stepwise commercialization can be implemented within current technology. The subsystems of data receive/record, command and control, image processing, assessment and analysis, and communications and distribution are readily separable. The distributed processing proposed is subject to the same comments as for Terra-Mar. The (apparent) desire for a central archive, as well as local, limited archives, is technically feasible; it requires only a data management decision. Since the "existing systems would be unaffected," federal global modeling capacities would not be affected in the near-term (8-10 years). However, the proposal postulates eventual replacement of government sensors by private sensors which could acquire "Landsat-like" data. It seems unlikely that the requirements for more advanced sets of multispectral data can be satisfied by Landsat-like private sensors. For example, geological researchers are finding that spectral resolutions on the order of 10-20 nanometers within the short wavelength region (1.1-2.6 micrometers) and 30-50 nanometers within the thermal region (8-14 micrometers) are showing enormous promise for extracting unique signatures of surficial minerals, thereby allowing inferences on subsurface content and structure. These capabilities are beyond the spectral resolutions on Landsat.

(4) National Security and Foreign Policy Concerns:

This response mentions some aspects of national security and foreign policy issues -- e.g., providing priority weather service to DOD. However, the entire concept is drawn up in the context of U.S. coverage only, with no provision for meeting federal needs for foreign area data, or for serving foreign users.

B. RCA - (RCA Astro-Electronics, RCA American Communications and RCA Service Company)

RCA believes that Landsat is a candidate for future transfer to private industry only if there are significant government commitments and financial

guarantees. While stating that both weather systems (polar-orbiters and geostationary) must remain in the government, RCA offers an alternate financing proposal, i.e., leasing of GOES and TIROS spacecraft, tracking, data reception and data distribution. The leasing option does not provide cost savings over the long term and does not include provisions for R&D, data processing, or launch services.

(1) Responsiveness to Federal Needs:

Not adequately addressed for evaluation, although a leasing arrangement could stipulate those requirements to be met.

(2) Continuity of Service:

Landsat is not addressed. Continuity of metsat data is assured for the duration of a lease.

(3) Feasibility

RCA has well-established technical credentials to perform as they have outlined. The proposed changes in operations and system upgrade do not represent technical risk or significant technical development. The postulated 3-axis stabilized version of GOES appears reasonable, but not enough information is given to assess the weight margin or implied lifetime. The proposed Satellite Operations Control Center (SOCC) functional flow is credible and achievable, but whether or not higher automation will result in "minimum on-site support" cannot be ascertained. A particularly attractive aspect was the approach to distributed processing architecture, single-point failure recovery, and redundancy. Somewhat questionable was the claim made for optimized real-time versus off-line partitioning for telemetry analysis, since it is not clear what may be optimum for SOCC functional allocations.

For data distribution, the proposal indicates that satellite communications are the best form of consolidation of National Weather Service (NWS) requirements, but the L-band frequency allocation would require a variance from the FCC. The relay capability proposed for the GOES satellite requires new design work plus development effort on the Marisat traveling-wave-tube, not an attractive prospect from a technical risk standpoint. The electronic specifications given for power, frequency, gain, bandwidth and sidelobes were not analyzed in detail, but appear reasonable.

(4) National Security and Foreign Policy Issues

There are no national security or foreign policy implications in the RCA response.

C. Hughes Aircraft Company - (Hughes)

Hughes does not propose to participate in commercialization activities and states that both land and weather programs should remain in the federal government for at least ten years. Hughes recognizes the national importance of land remote sensing data in international trade and global strategic resource inventories. Therefore, they propose that if transfer of land sensing should proceed, then: (a) The land and weather programs be addressed separately; (b) Vendor selection be done competitively; and (c) No dominant entity or monopoly be created.

(1) Responsiveness to Federal Needs:

Not applicable.

(2) Continuity of Services:

Not applicable.

(3) Feasibility:

Not applicable.

(4) National Security and Foreign Policy Concerns:

Not applicable.

D. General Electric Company, Space Systems Division (GE)

GE states, "The Landsat program continues to perform as a significant national asset." After extensive analysis, GE finds that private sector takeover of Landsat has unacceptably high business risks at this time. However, "...continuation of Landsat under government sponsorship is imperative to protect the $1 billion investment...and to permit eventual private sector involvement if it proves economically feasible in the future." Weather satellite systems are not addressed, and there is no basis for substantive evaluation.

(1) Responsiveness to Federal Needs:

Not applicable.

(2) Continuity of Service:

Not applicable.

(3) Feasibility:

Not applicable.

(4) National Security and Foreign Policy Concerns:

Not applicable.

E. Ocean Routes Inc. (OCEANROUTES)

This company strongly opposes the concept of transferring weather satellites to the private sector, since such an enterprise would have to be regulated and run as a monopoly with government subsidies or guarantees. They do not address land remote sensing.

(1) Responsiveness to Federal Needs:

Not applicable.

(2) Continuity of Service:

Not applicable.

(3) Feasibility:

Not applicable.

(4) National Security and Foreign Policy Concerns:

Not applicable.

4. CATEGORY FOUR - Other Responses.

Three additional responses were received which do not fit the criteria used in this report or explicitly address the questions outlined in the CBD announcement of September 10, 1982. Comments on these responses are included to express the additional interest generated by the Commerce announcement.

A. Autometric, Inc.

Autometric favors the move to commercialize civil remote sensing systems but believes a near-term move is premature, i.e., industry is being placed in a position of bidding on an unknown entity. If industry miscalculates the market, the government may have to "...bail them out." Autometric does propose a quantitative evaluation of the relative merits of the Landsat 4 Thematic Mapper, the French SPOT HRV sensor, and the Large Format Camera that will be flown on the Space Shuttle. The evaluation would be used to ascertain the commercial value of the Thematic Mapper data. No commercialization proposition or comments are provided.

B. Computer Sciences Corporation, (CSC)

CSC has been involved with the Landsat program since its inception. They do not comment directly on private sector transfer, but state a keen interest in the future of land sensing and request inclusion in further discussions which may be held with industry.

C. Robert Georgevic

This individual described himself as a University Professor from southern California. He did not respond in detail, but advocates retaining civil remote sensing systems in the U.S. government.

IV. LIST OF RESPONSES

Section	Response
1.A	Report, "Commercialization of Civil Remote Sensing," Communications Satellite Corporation (COMSAT), October 22, 1982.
1.B	Unsolicited Proposal, Environmental Satellite Data, Inc., September 17, 1982.
1.C	White Paper, "Civil Operational Remote Sensing From Space," Control Data Corporation, October 1982.
2.A	Document TMA 10-011-82, "Civil Operational Remote Sensing From Space," Terra-Mar, October 1982.
2.B	Report, "Response to the Request for Information With Respect to Civil Operational Remote Sensing From Space," American Science and Technology Corporation, October 22, 1982.
2.C	Letter to Dr. John H. McElroy, Re: "Civil Remote Sensing Satellites; Request for Information," Space Services Incorporated of America, October 22, 1982.
3.A	Document, "A Plan for Commercialization of the U.S. Civil Remote Sensing System," Remote Sensing Center - Hasbrouck, University of Massachusetts, October 21, 1982.
3.B	Report R-4412, "Private Sector Involvement in Civil Operational Remote Sensing from Space," RCA, October 22, 1982.
3.C	Report, "Commercialization of United States Civil Remote Sensing Satellite Systems," Hughes Aircraft Company, October 21, 1982.

3.D Letter to Dr. John H. McElroy, "Civil Operational Remote Sensing from Space," Space Systems Division, General Electric Company, October 21, 1982.

3.E Letter to Dr. John H. McElroy, Response to Secretary's Request for Information, Ocean Routes Incorporated, October 15, 1982.

4.A Precis, "A Quantitative Evaluation of the Landsat/TM, The SPOT/HRV and the Large Format Camera," Autometric, Incorporated, October 20, 1982.

4.B Letter to Dr. John H. McElroy, Computer Sciences Corporation, October 21, 1982.

4.C Postcard to Dr. John H. McElroy from Dr. Robert Georgevic, San Diego, California, October 12, 1982.

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REPORT

OF THE

GOVERNMENT BUSINESS REVIEW PANEL

ON

INDUSTRY RESPONSES

ON

COMMERCIALIZATION OF CIVIL REMOTE SENSING SYSTEMS

November 10, 1982

The DOC request for information (RFI) dated September 10, 1982, stated that the Secretary of Commerce is examining two issues, regarding the nation's civil remote sensing satellites, and requests the views of private industry on these issues. The two stated issues are:

1. "What is the best mechanism to implement the current policy of transfer of civil land remote sensing systems (Landsat) to the private sector as soon as possible?"

2. " Should the Administration consider simultaneously private sector transfer of both civil weather and land remote sensing systems?"

The RFI continued, saying "Private sector representatives are invited to present their views and expressions of interest on ownership and/or operation of the land and weather satellites and the likelihood of government saving in either mode..." The request for views and expressions of interest on ownership, etc., reiterated in the RFI in the first of eight items on which information was desired, produced a considerable number o. opinions on the stated policy transfer, "as soon as possible." Accordingly, the business committee also evaluated the responses to the policy. Regarding "transfer" the RFI stated that responses may include both, either, or any part of either system. The latter language, in effect, also requested private industry points of view on partial transfer to the private sector of civil weather and/or land remote sensing systems. The business committee therefore also evaluated responses to this issue.

Accordingly, this evaluation addresses four specific issues, the Administration policy of transfer as soon as possible, the best transfer mechanism, the simultaneous transfer of Landsat and weather satellite and ground systems, and fourth, the partial transfer of civil weather and/or land remote sensing systems. There then follows a fifth section which contains a grouping of sub-evaluations dealing with economics, legislation, terms and conditions, etc.

The business committee found that the common thread of all the responses to the RFI is that the current market, and, indeed the market for the forseeable future, is not large enough to provide for a profitable return on an investment in either the total land and/or weather civil satellite systemms unless government subsidies or guarantees are provided. This finding would support the premise, suggested by several respondents, that full commercialization of either or both systems must follow a vigorous program of market development starting with the value added users which will eventually permit backward integration into data processing, data receipt, and archiving, as well as the ultimate development and operation of orbiting sensors.

I. Comments/Evaluation on the Administration Policy of Transfer

Per discussion with NOAA officials, the committee has interpreted the Administration's current policy objective of transfer to mean a transfer of ownership of part or all of the civil land remote sensing satellite system. A lease proposal would not meet the objective and consequently was not considered by the committee as a "transfer". Further, a partial transfer of ownership which did not include the Landsat satellites was not considered as meeting the Administration's objective. The committee also viewed a phased or gradual transfer as not meeting the objective of a transfer "as soon as possible."

Of the fourteen responses, only two firms supported the policy in principal and only one firm, COMSAT, supported the specific stated policy of transfer "as soon as possible", but only if both weather and land systems are transferred simultaneously. COMSAT states that they have long been a proponent of commercializing the government's civil weather and land remote sensing satellite systems. Further, they say they are prepared to accept the responsibility for developing a commercial remote sensing system and to assume the technical and management risks if both are transferred, and a long term contract to supply data to the government is executed which provides the necessary financial foundation of a commercial operation. COMSAT believes that immediate transfer is essential to permit implementation of a private venture which can compete with foreign programs already underway.

The common observation of all replies was the recognition of the absence, today, of a private market which can economically support a land remote sensing industry. COMSAT, in its recognition of this issue, requested legislation that would provide for transfer of the Landsat and weather satellite system assets to a designated firm, i.e., COMSAT, and the designation of that firm as the single source for all the governments weather and land remote sensing data requirements. Legislation should provide that data and data products be eligible for copyright protection. The simultaneous transfer of both weather and Landsat systems is a COMSAT condition, to permit the revenues of the developed weather data services to reduce the financial risks associated with the land sensing data products American Science and Technology (AS&T) Corporation, of Bethesda, Maryland, supported commercialization of civil land remote sensing systems in that they have plans to launch a series of four low-cost, high technology, earth remote sensing satellites, starting in 1985, that will comprise an Advanced Earth Resources Observational System (AEROS). They have proposed to the government that they assume control of the two Landsat-D satellites and that they would integrate these satellites into the operations of their own satellites to provide the first U.S. commercial operational earth resources observational system. However, AS&T is not interested in the ownership of the existing Landsat system.

Four replies which take exception to the policy of transfer "as soon as possible" recognize that in the absence of a private market today, establishment of a single firm with government guarantees or subsidies would be required. This arrangement would result in that firm's domination of the evolving domestic industry. Opposition to this monopoly aspect is repeatedly stated.

In the aggregate, these replies recommend a gradual commercialization approach in consonance with the development of a private sector market.

Three other firms, large aerospace companies, which manufacture satellites for the government and private industry, all responded negatively to the Administration policy of near term commercialization. The General Electric Company responded that land remote sensing systems are not ready for private takeover, primarily due to the insufficient definition of the market to sustain a private venture." ...we determined that commercialization of remote sensing faces significant obstacles, resulting in unacceptable business risk. A premature push into the private sector before a formidable array of issues have been resolved and a proven market is shown to exist has high inherent business risks."

The Hughes Aircraft Company responded saying that establishment of suitable conditions for the transfer of the GOES and TIROS weather systems would be at the risk of disruption of a critical service and an encouragement of an unwise private capital investment policy. The transfer of Landsat to the private sector would be at considerable financial risk to any prospective private operator. Hughes stated: "It is the position of the Hughes Aircraft Company...that ownership of the United States civil land and weather satellite systems should remain within the U.S. government for at least the next 10 years."

RCA responded, "...we, RCA, have been unable to determine an adequate market for Landsat data without significant commitments by the U.S. government to the purchase of data (a form of subsidy)." "The value of weather satellite data to the safety and welfare of the public as well as the quid pro quo of domestic and international exchange of weather data, the dissemination of warnings, etc., preclude the possibility of private ownership of weather satellite data. This is truly a public service function for the United States and the world."

Control Data Corporation contends that the viability of the marketplace that must support a private sector operated remote sensing system is as yet untested and therefore "high risk." The sensitivity of this marketplace to conversion from a service-based operation to a profit-based operation is the fundamental issue in question. Given this uncertainty and the large capital investments required, Control Data Corporation envisions a transfer scenario today which would create a near monoply, which they oppose.

The University of Massachusetts also took exception to the Administration's policy on transfer of land remote sensing systems to the private sector as soon as possible. They stated: "Direct transfer of the Landsat or weather satellite systems in their present forms...is not the best solution. The systems were not designed from the outset to operate commercially." As an alternative the University of Massachusetts presented a plan calling for "modification of the current Landsat and weather satellite systems that would permit gradual and stepwise commercialization."

Terra-Mar takes the position that the transfer of the current system would provide for the operator the maintenance of a distinct advantage by developing the satellite data business to his benefit and the detriment of any future competition.

Space Services, Inc. does not challenge the intent of the Administration's policy but notes that "any decision to commercialize...must consider the impact of such action on a small but growing private sector which intends to provide commercial remote sensing services."

The remaining five responses did not address this issue.

II. This section contains an evaluation of responses to the first issue stated in the Dept. of Commerce RFI, namely "What is the best mechanism to implement the current policy of transfer of civil land remote sensing systems (Landsat) to the private sector as soon as possible?."

Of all the responses, only COMSAT suggests a mechanism for the transfer of Landsat as soon as possible. Their proposed mechanism is predicated on simultaneous transfer of both the weather and land systems.

They recommend the adoption and submission to Congress of a plan which:

1. recommends transfer as early as January 1984, assuming a go-ahead decision in November 1982,

2. designates a firm to own and operate a system, which firm will have been selected on the basis of its experience, qualifications, and expression of interest in response to the September 10, 1982, RFI,

3. calls for negotiations with the designated firm in time to support FY84 budget requirements, define legislative requirements, and produce final terms and conditions,

4. recommends implementing legislation be passed in 1983,

5. transfers to the selected firm the Landsat and weather systems space and ground segments, in return for a fair price.

The specifics of this transfer approach (mechanism) are dealt with in more depth in section V, Sub-evaluations, part 2, Terms and Conditions for transfer and part 3, Legal Considerations/Legislation.

III. This section of the Business Committee's evaluation summarizes industry responses to the second issue addressed in the September 10, 1982, RFI: "Should the Administration consider simultaneously private sector transfer of both civil weather and land remote sensing systems?"

Of the 14 responses received, 7 did not address this particular issue. One firm, COMSAT, responded with an emphatic "yes," maintaining, as mentioned earlier, that simultaneous transfer is the only mechanism by which successful development of a commercial system and realization of significant cost reductions to the government could be possible.

Listed below are key points raised by those (6) responding "no" on this issue.

Space Services, Inc. - No--should be considered separately. Including weather satellites will raise important, but unfortunate and unnecessary questions of cross-subsidies and monopoly power; Space Services, Inc. agrees with current "policy" that weather satellites should not be commercialized now--in light of public health and safety, national security, and international relations issues.

University of Massachusetts - No--(Alternative solution"--modification of current land and weather satellites that would permit gradual and stepwise commercialization--both systems would be involved, but weather might be only partially commercialized) - Federal government should keep Landsat going until "subsequent generations of sensors would begin to satisfy the bulk of the market. This would hopefully be achieved before the Landsat satellites cease operation."

The University of Massachusetts notes that the archives should probably remain under federal control until their need expires, and that the government may need to retain a federally operated weather data acquisition capability, to satisfy national security requirements.

American Science & Technology Corporation - AS&T's specific answer to the Secretary's question is "No"--if such a transfer involved a revenue subsidy from one system to another, a monopoly, or a guaranteed U.S. government data contract.

Terra-Mar - No--while the grouping makes significant operational and economic sense, the near term problems of untangling the political implications (treaty obligations, military programs, health and safety issues) of transfer of weather satellites outweigh potential commercial

benefits. This can be dealt with in time, but the difficulty of establishing the commercial viability of satellite remote sensing is great enough without adding the complications of a "potential hot potato." Terra-Mar also feels it would be politically unpalatable to pair the two in order to use weather profits to offset near term losses with the land system. (This approach would also lessen incentives to develop land remote sensing to its full potential.)

Hughes - No--conditions for transfer of weather systems could only be established at considerable risk to both government and industry--transfer of Landsat to the private sector would involve no risk to the government, but considerable financial risk to private operator. If the government proceeds anyway, HAC believes the Landsat, TIROS, and GOES systems should be considered separately.

RCA - No--public safety, international agreements, etc., "preclude the possibility of private ownersip of weather data" (RCA proposes lease arrangements for both land and weather.)

IV. Alternative Commercialization Approaches

Of the 14 responses, 7 supported a policy of gradual and/or partial commercialization of civil weather and land remote sensing systems. The single common denominator of the seven responses is the recognition of the absence today of a private market which could economically support the commercialization of the total Landsat and/or weather satellite system. Also, it appeared that each respondent had a vested interest in their specific recommended approach. This should not necessarily diminish the value of the responses, but rather be seen as a healthy and possibly broad based interest in the development of a private sector, remote sensing industry.

RCA recommends the government request firm proposals for a lease arrangement for all elements of the Landsat system and some elements of the civil weather system. The request should include a profit inducement to expand the market of national and international users of Landsat data. Their approach envisions initially a lease approach, which would permit the gain of operating and marketing experience thereby permitting government and industry to better determine the details and viability of eventual private ownership.

The University of Massachusetts recommends a plan which features step by step non-disruptive decentralization of the systems components, and creation of real market incentives for commercialization which would obviate the need for federal incentives such as subsidies or data purchase guarantees. The plan calls for a gradual phase down of federal programs, except possibly for segments of the weather satellite system, with the end product being full commercialization of the U.S. civil remote sensing system, without government funding or subsidy at any point. The University of Massachusetts' immediate interest in the plan is an Automatic Data Acquisition and Processing System which they designed. They feel the system could be developed at low cost and permit direct data acquisition from multiple sensors, providing automatic data processing, and data transmission direct to users.

Control Data replied much along the preceding recommendations of the University of Massachusetts. Control Data believes that transition to the private sector can occur and that transition should be gradual and begin with the ground segment. Control Data, however, states that user requirements are untested and therefore a high risk aspect of the transition is the viability of the marketplace. Transition success is contingent upon achieving a viable and self sustaining business entity. Accordingly, Control Data recommends a cooperative government and industry venture to operationally validate the mechanisms for transition from a subsidized service-based operation to a product based "for profit" operation. The vehicle is a Landsat User Service Center which would perform the current Goddard and EROS data processing and distribution functions. The Center would handle all functions in support of full transition to the private sector in a 2 to 3-year time frame. They see Control Data to be a candidate operator of the Landsat User Service Center they recommend.

American Science and Technology (AS&T) advised of their plans to launch a series of four low-cost, high technology, earth remote sensing satellites starting in 1985, that will comprise an Advanced Earth Resources Observavational System (AEROS). They propose to assume operational command and control of the two Landsat D satellites from the U.S. Government, and to integrate these satellites with their own satellites into the first U.S. commercial operational earth resources observational system. AS&T does not propose to develop or own any ground segment facilities; they would market the data from the Landsat and AEROS satellites to any entity world wide that installs a ground station and pays an annaul access fee. AS&T proposes that transfer of control be effective January 31, 1983.

Space Services Incorporated of America (Space Services) believes that private ventures can replace the government's Landsat programs and make a profit. Space Services, however, has no intention itself, to purchase or operate the Landsat system. Space Services is a private venture developing a low cost, low earth orbit launch vehicle. Space Services' interest therefore is in launching private civil remote sensing satellites and they would provide launch services for the AEROS system discussed in the preceding paragraph. Accordingly, Space Services submits that commercialization of government programs must be accomplished in a way that does not inhibit investment in independent private ventures.

Terra-Mar responds that it would be very difficult to designate one company to assume the operation of Landsat with the subsequent responsibility for developing the market. They indicate that a company with both the appropriate operational and marketing skills does not exist. In the immediate future, improvements in data processing and data distribution will stimulate the value-added activity which is already occurring, thereby increasing revenues from Landsat data sales as new applications become established in the marketplace. Terra-Mar further states that these increasing revenues will provide the strength among private sector operators to permit backward integration into data receipt and archiving as well as the development and operation of orbiting sensors. In this mode, they state, healthy competition will encourage the creation of new applications software as well as encourage the companies with the best capabilities to assume a leadership role in developing a fully integrated earth resources information system.

The seventh and final response dealing with alternative commercialization approaches was Environmental Satellite Data, Inc. This firm proposes an immediate commercialization of segments of processing and distribution of GOES weather satellite data. ESD states the following premises:

(1) A market exists for more highly processed weather satellite data.
(2) The market is willing to pay for such data.
(3) Private industry is capable of meeting the demand for this data.

V Sub-evaluations

This section presents evaluations on subsets of the basic issues, and in the aggregate, comments on the business considerations in the eight points in the RFI on which additional information was requested.

1. Economics/Cost Considerations

The economic evaluations in this subsection are on an individual responder basic and address the financial consideration of the individual responders' recommendation. No two responders presented the same approach and therefore there is no common comparison available in these economic evaluations.

Only six companies made estimates of costs and/or savings related to their proposal. The government made an attempt to validate all cost savings figures in each proposal. Since we were unable to discuss the proposals with the companies, assumptions were made when their intent was unclear.

Under all of the proposals, the government will continue to incur costs related to Landsat and/or Metsat. This amount varies depending on the amount of commercialization proposed. Even in the most extreme case of commercialization, 29 people will still be employed by NOAA for management and overview at a cost of about $1.6M annually.

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3. Legal Considerations/Legislation

(1) Anti-Competitive Aspects of Proposals/Monopoly

A common concern expresed by ASTEC, COMSAT, Control Data, Hughes, Ocean Routes, and SSI is that in order for the private venture to be commercially successful, the private venture would have to be protected from competition or receive special favored treatment in legislation or a government contract or both. What follows is a discussion of primarily the COMSAT proposal which was the proposal that specifically identified the protection or favored treatment required.

A "monopoly" is defined in Black's Law Dictionary (4th ed.) as:

"A privilege or peculiar advantage vested in one or more persons or companies, consisting in the exclusive right (or power) to carry on a particular business or trade, manufacture a particular article, or control the sale of the whole supply of a particular commodity."

The Commerce draft bill "The Land Remote Sensing Satellite Authorization Act of 1981" would have created such a monopoly, and it was strongly objected to by the Department of Justice. Enclosed is a copy of the letter of May 4, 1981, from the Department of Justice to the Director of OMB containing its objections.

Competition Permitted with Designated Private Venture

The COMSAT proposal dated October 22, 1982, appears to differ from the Department of Commerce' 1981 draft bill in one very important element. It does not request that the COMSAT entity which owns and operates the civil remote sensing system be the only one authorized to do so in the United States. Other competitors could establish and operate their own systems and compete with COMSAT for the non-government market.

U.S. Government Requirements Purchased Only from COMSAT

The Department of Justice objected to a provision in the 1981 Department of Commerce legislation that would require the U.S. government to purchase all of its data and data requirements from a single entity. COMSAT proposes a similar legislative and contractual requirement for a minimum of 15 years. The Department of Justice considered this to be a special advantage to that single entity that would discourage competition.

United States Government Prohibited from Setting Up a Competing Land Data System with COMSAT

COMSAT proposes that legislation be enacted stating that all additional or "new data" requirements of the U.S. government be procured solely from COMSAT. This would preclude purchase of data from other U.S. commercial entities as well as foreign systems, which could be very disadvantageous if the competing sources were able to provide data not available through the COMSAT systems. It is likely that the Department of Justice would view this proposal as discouraging competition. COMSAT also proposed that legislation prohibit the U.S. government from setting up a competing land data system.

Proprietary Rights/Copyright/FOIA

COMSAT asks that legislation be enacted (1) protecting data and data products against unauthorized use or misappropriation; (2) protecting data and data rights by copyright; and (3) protecting data and data rights from compelled disclosure under the Freedom of Informtion Act.

If draft legislation would be enacted with respect to items (1) and (2) above so that the protection would extend not only to COMSAT but to any entity which produces data or data products, it is likely that the legislation would not be opposed by the Department of Justice. The House Subcommittee on Space Science and Applications in its report on "Civil Land Remote Sensing System" (December 1981) page 2, stated that it believed that copyright protection was necessary. The details of the COMSAT legislative proposal would be important in assessing the feasibility of the legislation. Presumably, COMSAT is not requesting legislation which would involve the United States government in bringing suit against those who make unauthorized use or misappropriate data or data products.

With respect to item (3)--the Freedom of Information Act--COMSAT proposes that an opinion be sought from the Attorney General. The issue apparently is whether data from the remote sensing satellite can be obtained from the United States under the Freedom of Information Act at the cost of reproduction only. In my view the simple way to put this issue to rest is to provide in the legislation that such data while in the hands of the U. S. are not agency records.

The committee forwarded the COMSAT proposal on October 29, 1982, to Ms. Catherine G. O'Sullivan, Antitrust Division, Department of Justice and requested the "tentative views" of the Antitrust Division on that proposal. The letter requesting her views is enclosed. The Antitrust Division responed by letter of November 5, 1982, (enclosed) that it had some concerns, but would need additional data in order to analyze the COMSAT proposal. The Department of Justice also suggested other lines of inquiry that should be pursued in studying the commercialization of Landsat.

Adverse Effect on Private Ventures

Several proposers, including Control Data and SSI, were concerned that legislation or contracts which are anti-competitive in nature would cripple or destroy private ventures.

It is probable that those private ventures that in fact are subsidized today by obtaining, nearly free of charge, data and data products and who then reproduce them for further sale at a profit, would be adversely affected. They would lose their subsidy and would be required to respect the protection afforded private property--the data and data products. It cannot be determined whether the acceptance of the COMSAT proposal would drive these private ventures out of business if they had to pay the COMSAT price for use or reproduction of data and data products.

Insofar as the COMSAT proposal requires the largest user in the market (the U.S. government) to procure all of its data and data product requirements from COMSAT for 15 years, that indeed would destroy those private ventures which currently plan to provide the data and data products to the U. S. government and would discourage any future competition or innovations.

(2) Feasibility of Proposed Legislation and Contract Provisions

Here the discussion is solely limited to the COMSAT proposal since only that proposal provided some detail as to what legislative provisions and contractual provisions in the government contract were necessary.

COMSAT proposed that the U. S. government enter into "negotiations" now so that an acceptable draft contract may be submitted to the Congress for approval. COMSAT proposed that this draft contract and the implementing draft legislation designating COMSAT should be submitted to the Congress for enactment in 1983. Transfer of the system should begin January 1, 1984.

(a) Sole Source Selection of Contractor

COMSAT contends that the Secretary of Commerce should select a private corporation based upon the interest expressed in response to the Secretary's request for information as well as the "technical and institutional qualifications; experience of the corporation and preliminary negotiations carried to the point where the parties share confidence that a mutually satisfactory contract can be achieved. This is the only approach which could result in a transfer as early as January 1984." (Underscoring added.)

Based on the current record, it would not be consistent with common sense conflict of interest provisions frequently used in government procurements to have a government contractor develop what it believes to be reasonable specifications and terms and conditions for a government project and then permit that same contractor to compete with other private companies in the government competition for award of that contract for that project. An exchange of information by discussion or otherwise with all potential competitors and the Department of Commerce as to what would be reasonable and acceptable contractual provisions would on the other hand, be appropriate, and not be inconsistent with prior procurement practice.

Clearly, there appears to be support for the proposition that any government contract should be competitively awarded. See House Subcommittee on Space Science and Applications Report on "Civil Land Remote Sensing System" (Dec. 1981) p. 2 and the U. S. government agency comments on the 1981 Department of Commerce draft bill. To the extent the COMSAT proposal may be read as suggesting that the award should be made under a sole source justification to COMSAT, it is not clear that this would be permitted under current laws requiring competition. Based on the record there has not been a showing that only one private entity could do the work planned. It would be consistent with law and government procurement procedures to competitively secure a contractor by issuing a solicitation.

(b) 15 Year Requirements Contracts

COMSAT proposes a fixed price minimum quantity, all government requirements contract with COMSAT for at least 15 years for data and data products, with a mechanism for defining future government requirements and a method for pricing them (COMSAT proposal: Vol. II p. 7 and Vol. I p 11-12). The contract would contain an inflation escalator and provide for a reduction in price to the government by a percentage of commercial sales.

These are extraordinary procurement provisions. The provision for 15 years duration and contracting for currently unknown but future data and data product requirements are particularly unusual and would probably require legislation. This is so because normally agencies are authorized to obligate the government for only one fiscal year; the appropriated funds for some agencies are to be used soley for the needs of the fiscal year.*

*U.S. government agencies who may procure data and data services have a variety of periods within which appropriated funds may be used. NOAA has no-year money. NASA has 2-year money.

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In addition, under the Anti-Deficiency Act, an agency may obligate the government only to the extent it has appropriated funds; here the obligation must be determined in advance by negotiation for the period of 15 years and adequate appropriations for the entire period must be obtained before the contract is executed in order to avoid violating this Act, if COMSAT's proposal is to be met. Finally, competition normally would be required under our laws and procedures when the government requirements are known. COMSAT in effect proposes that we execute a sole source contract now for unknown requirements.

(c) Liability to the Government and Customers

COMSAT proposes that it will use its "best efforts" as the system owner/operator but that COMSAT's liabiity should be appropriately limited with respect to the government and third parties.

The appropriate limitation is not further discussed and therefore this pithy statement cannot be further analyzed.

One might ask whether COMSAT will contractually agree to hold harmless and indemnify the U.S. government and its contractors who established the remote sensing system sold to COMSAT, for potential product liability exposure and for any potential liability of the United States arising out of the operation by COMSAT of the system.

Further, one might ask whether, as part of COMSAT liability for breach, COMSAT will contractually agree to turn over the entire operational system to the United States government at a reasonable price, if COMSAT should materially breach its agreement with the U. S. government in that it fails to meet its obligation under the government contract and other contracts.

(d) Liability of the Government

COMSAT proposes that one of the provisions of the contract and legislation should provide (Vol. 1 p 12) "Payment of any liability of the government which may accrue (including termination by the government for its convenience)."

Clearly legislation would be required to provide for the potential termination liability that may reasonable accrue if the government terminates the contract for its convenience.*

*Presumably, if the COMSAT request for full obligational authority for 15 years is met, no further legislation would be required to ensure payment of the governments termination liability.

Absent such legislation, an Anti-Deficiency Act violation would occur if the Department of Commerce obligated itself to reimburse COMSAT reasonably for the cost of termination without adequate appropriations therefore.

It is not clear what else COMSAT seeks by contract or legislation by this quoted language. If it seeks indemnification for its own liabilities, this probably would be opposed by the Department of Justice which has been consistent in its opposition to indemnity unless an extraordinary justification can be made to support it.

Insofar as it suggests that the government should reimburse COMSAT for damages if the U.S. government breaches its contract, clearly this is appropriate but new legislation is not requiried to obtain this result.

(e) Full Obligational Authority

COMSAT requests "Necessary obligational authority and appropriation for full contract amount." COMSAT may be seeking legislation to obtain for U.S. government agencies the full appropriations necessary to pay for whatever may be purchased under the contract over a period of 15 years, as negotiated by the parties.

On the other hand, COMSAT may be seeking a permanent appropriation. In this respect, it is difficult to understand why COMSAT should be treated differently than any other U.S. government contractor. Such legislation would reduce the risk of a subsequent Congress not appropriating sufficient funds to continue the contract work for 15 years.

(f) "Management Flexibility to Modify and Improve System Efficiency and Operation

COMSAT states that this management flexibility should be dealt with in the contract. One might ask why this is so. It is a fixed price contract that COMSAT is suggesting that the cost of improving system efficiency and operation will be passed on to the U.S. government as part of contract modifications.

(g) Government Regulation by Contract

COMSAT proposes that the contract "establish arrangements for required government control such as directions regarding the acquisition or dissemination of data products for reasons of foreign policy, national disaster, national emergency, or national security."

Would the U.S. government be required to pay a premium price for priority over other customers or the exercise of its authority to control?

(h). Protection of Data and Data Products

It appears that the enactment of copyright laws protecting data and data products is feasible. In the 1981 Department of Commerce draft bill, copyright protection was proposed. As far as the committee can determine only the Department of Agriculture was opposed to that proposal.1/ The House Subcommittee on Space Science and Applications, 1981 report 2/ agreed that "Copyright provisions will be necessary to protect both the operator and the additive value industry." It should be noted that the same Sub-committee also recommended that "The United States should continue the policy of open access to civil remote sensing data and continue to encourage international exchange and assistance.3/ Consequently, the policy of non-discriminatory access to data is to continue along side the requirement that the data be protected by copyright and by other regulation. This is possible since the copyrighted data or data products can be sold or, under an international agreement, provided free of charge. The U.S. government could pay the commercial entity which provides the data a reasonable price for that data transferred to the foreign government. That transferred data or data products probably would be protected from further reproduction by copyright.

A subsidiary question is whether United States policy or current United States Agreements would be inconsistent with the application of the proposed laws authorizing copyright protection to data and data products. Through bilateral arrangement, Landsat data is being received by ground stations located in Canada, Brazil, Argentina, Japan, India, Italy, Australia, Sweden and South Africa. Additional stations are planned for Indonesia, Thailand, and China. These foreign countries pay the U.S. a yearly fee for access to data.4/ Under current U.S. civil space policy, the U.S. generally supports direct readout of land data by foreign ground stations from interim and full fully operational systems.5/

1/Agriculture contended that all federal agencies should hgave unrestricted use of the data for reproduction of resale. The CIA recommended a reductiono waiver of royalty fees for federal agencies.

2/Report on "Civil Land Remote S ensing" December 1981.

3/See page 2 of the Report identified in footnote 2.

4/See to this effect the House Subcommittee on Science and Technology Report on "Civil Land Remote Sensing System" (Dec. 1981) p. 9

5/See Hearings of the House Subcommittee, identified in footnote 1 on "Operational Civil Remote Sensing Systems," 96th Cong. (1980) pp 293-296.

With respect to remotely sensed weather data, there is a current United Nations policy that "Access to data from operational meteorological satellites is free, and because many countries have become dependent upon this system, it is necessary to ensure continuation and intensification of such services."6/ The United States agreed to this statement of policy in 1982 at the Unispace 82 conference in Vienna.7/

There does not appear to be any United States law or treaty which would require that data remotely sensed by the United States or a private corporation must be provided in the future free of charge to all foreign governments which request it.

There are indeed, agreements between the U.S. government and foreign governments which provide for the exchange of certain remotely sensed data and data products. Any legislation or contract dealing with the commercialization of remote sensing satellite systems must take these agreements and U. S. policy previously referred to into account, so that the United States obligations and policies will continue to be met by the entity which takes over the systems. Such legislation and government contracts could also provide that the private entity should receive appropriate payments from the United States government for the transfer of such data and data products to the foreign governments in accordance with the requirements in United States agreements with those foreign governments. Future international agreements could simply recognize that a reasonable charge would be imposed for such data and data products.

COMSAT's proposed legislation provides that "nondiscriminatory access to data must be accorded to non-U.S. government users, both domestic and foreign, pursuant to commercial terms and conditions." (Underscoring added.) The concern here is whether "commercial terms and conditions" means that COMSAT may give to a customer exclusive priority access of the data for a period of time before giving nondiscriminate access to the rest of the world. The Department of Commerce has previously taken the position that such exclusive priority access was contrary to long established foreign policies supporting open, non-discriminnatory, dissemination of sensed data. NASA has taken the position that such exclusive priority access would be permissable.8/

6/ Report of the Second Committee of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (August 19, 1982) (Unispace 1982), paragraph 174. See also the report of the First Committee, paragraph 88.

7/ As reported by S. Neil Hosenball, General Counsel of NASA, a member of the Unispace Delegation, on November 1, 1982, the report was adopted by consensus in the Plenary Session of the Conference.

8/ June 8, 1981, letter of Dr. Calio, Associate Administrator for Space and Terrestrial Applications to the Administrator of NOAA. At that time Dr. Calio was employed by NASA.

United States Department of Justice

ASSISTANT ATTORNEY GENERAL
LEGISLATIVE AFFAIRS

WASHINGTON, D.C. 20530

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Honorable David A. Stockman
Director
Office of Management and Budget
Washington, D.C. 20503

Dear Mr. Stockman:

Pursuant to your request, the Department of Justice has reviewed the Department of Commerce draft bill, the "Land Remote Sensing Satellite Authorization Act of 1981." This proposed legislation would authorize the Secretary of Commerce, acting through the National Oceanic and Atmospheric Administration, to operate initially and to regulate on a permanent basis a civil operational land remote satellite system. In our view, the bill raises a number of serious concerns that merit further consideration before the bill is proposed to Congress.

The Bill

The introductory sections of the proposed bill set forth its underlying premises. Section 2 provides for congressional findings that "[t]he private sector has the technical capability and financial resources to develop, own and operate a land remote sensing satellite system in the United States" (§2(4)), but that "[c]ontinuing research and development of land remote sensing space technology by the Federal Government is essential for improved remote sensing capabilities" (§2(5)) and that the federal government will own and provide data from satellites until a company or consortium of companies from the private sector is selected to develop, own or operate a system (§2(6)). Section 3(c) sets forth various policy goals, including encouraging the widest practicable dissemination of data

ENCLOSURE 1

and standard data products obtained by the system on a nondiscriminatory basis, ensuring that users share fully the costs of operating the system, and fostering international participation in the system. Section 3(6) declares that "[a]ll United States land remote sensing satellite systems will be authorized and supervised or regulated by the Federal Government."

Title I of the proposed bill provides for the selection and designation of a private owner or owners for "the U.S. land remote sensing satellite system." The Secretary would review applications to develop, own and operate all or part of the system and to provide data and standard data products to the federal government (§101). Section 102 sets forth eight factors to be considered by the Secretary, including the "extent to which the applicant proposes to purchase or manage any of the system assets owned by the Federal Government" (§102(a)(3)), the "impact upon competition in the aerospace or data processing industry of selecting a particular applicant" (§102(a)(7)) and the "potential for conflicts of interest between an applicant and (1) users of data and standard data products, (2) the value-added industry, or (3) potential equipment suppliers" (§102(a)(8)). */ In evaluating the applications, the Secretary would be required to consult with various federal departments and agencies, including the Department of Justice and the Federal Trade Commission with respect to the impact upon competition (§103(b)2). All applicants would be required to agree to certain conditions, including establishment of "reasonable, nondiscriminatory and consistent" prices for United States and foreign users (§102 (b)(2)). The Secretary would be authorized to recommend that no applicant be designated (§104(a)).

Section 106 of Title I would empower the Secretary to authorize and regulate other land remote sensing satellite systems. Such systems could be authorized, however, only upon the Secretary's determination that the additional system "is in the national interest or is required to meet a unique governmental need", after consideration of the impact on the ability of the Secretary to conclude an agreement with an eligible applicant concerning the U.S. system or the financial viability of the U.S. system, if an eligible applicant has already been selected.

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*/ "Value-added" is defined in section 3(10) as the "process of deriving information from, enhancing or interpreting standard data products by computers or otherwise."

Title II provides for supervision of the designated owner or owners of the U.S. land remote sensing satellite system. Upon receiving the approval of the President, the Secretary would enter into an agreement, for a term not to exceed fifteen years, with the designated owner or owners to provide data and standard data products meeting the needs of federal departments and agencies (§201(a)). This agreement must include the conditions specified in Title I, and may include other specified conditions, including a requirement that the designated owner "perform value-added services in a manner that will not restrain competition" (§202). At the request of the designated owner, the National Aeronautics and Space Administration, upon reimbursement or other arrangement, would provide advice and assistance with respect to research and development, as well as launch and satellite tracking and data relay services (§204). Upon the request of the Secretary, the Department of Justice would be authorized to bring a civil suit to enforce the statute, regulations promulgated by the Secretary, or the agreement (§207). Private citizens would also be authorized to bring civil suits or to intervene in suits brought by the Department of Justice (§208). Section 207(b)(1) would require the Secretary to terminate the agreement for failure to comply substantially with the mandatory terms and conditions. In the event of such termination, the Secretary would be authorized to acquire any assets required to meet the government's needs for data and standard data products.

Title III would authorize the Secretary to operate a land remote sensing satellite system based on the Landsat D satellites and related ground systems procured by the federal government until a company or consortium of companies is selected and assumes responsibility for ownership or operation of the U.S. system (or to resume such responsibility in the event that the private sector proves unable to operate the system or that the designated owner's agreement with the Secretary is terminated) (§301). The Secretary's powers would include setting user charges (§302), as well as acquiring, preprocessing, processing, disseminating and archiving data and standard data products (§301(b)(1)). Federal departments and agencies would be required to procure necessary data, standard data products and services of the kind available from the Secretary through the Secretary, except where the Secretary determines that such needs can only be met by another land remote sensing satellite system (§302(b)(1)). The Secretary would be authorized to secure copyrights for the United States as author or proprietor in data and standard data products produced by the system (§304).

Title IV provides for interagency transfer of equipment and functions, together with reports to Congress. It also authorizes appropriations for operating the system and selecting and supervising the designated owner(s).

Discussion

The land remote sensing satellite industry is only now beginning to develop, and it is much too soon to predict with confidence the precise path of its evolution. NASA-sponsored research has played a vital role to date in developing the basic technology, but it is not clear whether it will be necessary or appropriate for the government to assume such a central role in years to come. We can only speculate at this point about the extent and contours of the future market for data generated by land remote sensing satellites systems, and can envision with no more certainty the numbers and characteristics of the future providers of such data.

We believe that it would be a serious mistake to impose on this industry at such an early stage a pervasive and rigidly structured system of regulation designed to control its future development. This is particularly true in light of the unprecedented rate of current progress in satellite technology and other technologies that directly support it, such as computer and telecommunications technology. Our experience with developing industries, such as the airline and trucking industries, demonstrates the substantial likelihood that a regulatory structure designed to encourage and protect a fledging industry will become an inefficient encumbrance, restraining the vigor of both the infant and the mature industry. Recent experience also suggests the enormity of the task of dismantling such a regulatory structure. */

In our view, the pervasive scheme of governmental involvement and regulation that would be established by this proposed legislation presents such a threat. It would impose on the industry for the indefinite future a structure dictated by a set of current assumptions, which may not prove valid in the long run, and which may indeed begin to prove unwise very shortly.

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*/ See, Report of the Subcommittee on Administrative Practice and Procedure of the Senate Committee on the Judiciary, Civil Aeronautics Board Practices and Procedures, 94th Cong., 1st Sess. (Comm. Print)(1975). In the case of the airline industry, efforts to deregulate did not bear fruit until decades after the defects of regulation began to be recognized.

At the core of the proposed legislation is the assumption, made explicit in the section-by-section analysis, that land remote sensing satellite systems should be treated as a natural monopoly (see pp. 10, 12). Thus, the proposed legislation emphasizes the development and protection of a single, favored "U.S. land remote sensing satellite system." We are aware of no inherent limitation on the feasibility of competing systems, however, requiring creation of such a monopoly. Although, as the section-by-section analysis notes, land remote sensing satellite systems may be a capital-intensive industry (p. 12), that alone is not sufficient to render the industry a natural monopoly. We see no reason at this very early stage to doubt the technical and financial capability of the private sector to develop and make available land remote sensing satellite technology; indeed, the bill affirms its authors' confidence in that ability.

In the absence of compelling reasons to conclude that competition is unworkable in this industry, we would not favor measures to promote a government-initiated and regulated monopoly. There is no reason to assume now that competition would have undesirable effects; if and when any such effects occur, legislation can be designed specifically to deal with them. Therefore, we believe that the provisions of the bill designed to favor the U.S. system and limit the potential for competition, and thus the possibilities for alternative system designs, are unjustified.

The most serious such limitation on competition in the land remote sensing satellite industry is contained in section 106, which would limit entry into the market in order to protect the favored U.S. system. There is no logical basis for this provision. If the proposed system cannot initially pay its own way, then no private party could rationally seek to compete with it. And, if it can pay its own way, there is no reason to limit new entry. If there are technical or other considerations that are now so clear as to require from the very beginning some restrictions on the numbers or types of satellite systems that should be permitted, such restrictions should be narrowly tailored to meet those specific concerns. In our view, however, a broad restriction designed to protect one favored system from any private competitive initiatives is not warranted, even under the rationale stated in the proposed bill.

The U.S. system would also be favored over any competitors by other provisions of the bill. Section 302(b)(1) would require the federal government to deal exclusively with the Secretary while the Secretary operated the U.S. system unless an agency's needs could only be met by a competitor, as determined by the Secretary. The section-by-section analysis

suggests that such a requirement could also be imposed after the private sector assumes responsibility for the system (p. 16). Moreover, after the private sector assumes control over the U.S. system, section 201(a) would direct the Secretary to enter into an agreement with the owner "to provide data and standard data products that meet the needs of federal departments and agencies." This provision could also be interpreted to permit negotiation of a full requirements contract, requiring the U.S. Government to procure data only from the U.S. system. These provisions could not only deny competitors access to an important customer, but might also deny the federal government the benefits of choosing among available competitive offerings. Section 204 would give the U.S. system another special advantage by requiring NASA to provide advice and assistance to it, but not to competitors.

The fact that the government would develop and operate a U.S. land remote sensing satellite system, at least in its initial stages, adds to our concern. We understand from the explanatory material that NASA is already engaged in the procurement and development of land remote sensing ("Landsat") satellites, two of which are scheduled for launching in 1983 and 1985 and are expected to be operational until 1988. Among the apparent purposes of the proposed legislation are to authorize the Secretary to develop an operational system to make full use of these satellites, and to provide for the orderly transfer to the private sector of these assets for use in connection with the next generation of satellites. While we are not opposed in principle to those goals, we are concerned that direct participation by the government in the commercial operation of a U.S. system may have the effect of discouraging private initiative, particularly if the features of the bill favoring the single U.S. system and limiting the possibilities for competition are retained.

The private sector's incentive to undertake development of a land remote sensing satellite system independently may be diminished, at least in the short run, by the knowledge that the government is developing a commercially operational system, to be transferred to the private sector. Since the U.S. system would be developed originally by the government, based on NASA-procured satellites, the private sector may be effectively foreclosed from playing any role in the initial design of the system. The designated owner of the U.S. system would likely wish to build on the system already established by the government, rather than designing a system anew. Thus, until that owner is selected, private firms may have little incentive to

explore alternative design possibilities. */ Moreover, there is a risk that private firms may be discouraged from offering more limited services for which technology is or will shortly be available, if by so doing they will come into competition with a government-run system enjoying protected status.

Therefore, we believe it important that the government's role be no broader than necessary. At the least, the legislation should be tailored to limit the government's temporary operational role to those services that would not otherwise be offered by the private sector and that are integral to the efficient use of the NASA-developed satellites. We would also strike the balance in favor of turning the system over to the private sector as soon as possible and letting the private transferee assume as much of the burden of developing a commercially viable operation as possible. Necessary governmental assistance in the future development of technology need not necessarily be linked to the operation of a commercial system.

Finally, even assuming that a permanent system of entry regulation is required at this stage, the safeguards contained in the bill are inadequate to insure that competition in other markets would not be adversely affected. We note that section 102(a)(7) requires the Secretary to consider only the impact upon competition in the aerospace or data processing industries in evaluating applicants to own the U.S. system. We see no reason to limit the consideration of competitive impact to those industries, since any industry in which the designee competes or with which it has substantial dealings could potentially be affected by its control over a favored U.S. system. Moreover, whenever a regulated monopolist also offers unregulated goods or services, there may be an incentive to exercise market power in the regulated market in a manner designed to affect competition in the unregulated market. We do not see how that danger can, as a practical matter, be eliminated through the regulatory measures proposed. The more severe the constraints on competition to the U.S. system, the more serious the concerns we would have in this regard.

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*/ The bill would also limit foreign ownership or investment in the system (§3(4)), which could limit the resources available for development. We express no view on the necessity of such a restriction from the standpoint of national security.

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In sum, we recognize that the government has a legitimate interest in encouraging the development of land remote sensing satellite technology. We are concerned, however, that the evolution of this industry not be constrained by an unnecessarily interventionist regulatory structure that will almost certainly prove inappropriate in the long run. Therefore, we urge that any legislation in this area be carefully tailored to limit the role of the government to those specific areas where its involvement is clearly required, and to avoid imposing restraints on private development before their necessity is clear. */

For these reasons, the Department of Justice would strongly recommend against the proposed bill.

Sincerely,

Michael W. Dolan
Acting Assistant Attorney General
Office of Legislative Affairs

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*/ There are also certain technical details which may require further consideration. Section 208(b)(1)(B) provides for intervention as of right by private parties in actions brought by the Department of Justice. We do not believe that such intervention would be appropriate. Moreover, it appears that a provision may have been omitted inadvertently from section 208(b).

GK-3(82-32089) October 29, 1982

Ms. Catherine G. O'Sullivan
Antitrust Division
Room 3121
Department of Justice
10th & Constitution Avenue, NW
Washington, DC 20530

Dear Ms. O'Sullivan:

I forward herewith a copy of Comsat's response to the Secretary of Commerce's September 3, 1982, invitation for expressions of interest in the ownership and operation of the Government's civil weather and land remote sensing satellite systems.

I would appreciate your review and comment on the Comsat proposal from an antitrust point of view. I am a member of the interagency task force (the Business Section of that task force and not the Technical Section) designated by the Department of Commerce to review the responses received by the Secretary of Commerce as a result of his September 3, 1982, invitation. I request your review and comment by November 3, 1982. I apologize for the short period of time but our Business Section is required to provide a report to Dr. John McElroy early in the week of November 8, 1982.

I ask your review with the focus on the potential anti-competitive problems the Comsat proposal may create. Specifically, I ask for your comment which provides your tentative views on the questions: (1) Without legislation excluding Comsat from the reach of the antitrust laws, would Comsat be in violation of those laws if the Comsat proposal were accepted by the Department of Commerce? (2) Would the Department of Justice recommend that the legislation proposed by Comsat not be enacted because of its anti-competitive affect or for other reasons of concern to the Antitrust Division?

Some of the elements that may be of concern are that Comsat proposes:

(1) Comsat would own, control and operate the civilian remote sensing system now owned by the United States Government.

ENCLOSURE 2

(2) The United States Government would be obliged to acquire all of its remote sensing data from Comsat for 15 years.

(3) The United States Government would be obliged not to set up a competing land data system with Comsat.

(4) Comsat would obtain proprietary rights in the data.

I appreciate your help.

Sincerely,

Robert J. Wojtal
Attorney-Advisor

Enclosure

U.S. Department of Justice

Antitrust Division

Office of the Deputy Assistant Attorney General *Washington, D.C. 20530*

November 5, 1982

Robert J. Wojtal
Attorney-Advisor
National Aeronautics and
Space Administration
Washington, D.C. 20546

Dear Mr. Wojtal:

This letter responds to your letter of October 29, 1982, addressed to Catherine G. O'Sullivan, of the Antitrust Division, regarding the Comsat proposal to assume responsibility for the Land Remote Sensing Satellite System ("Landsat") and for the meteorological satellite system now under the operation of the National Oceanic and Atmospheric Administration.

There are a number of facets of the Comsat proposal that raise concerns to the Antitrust Division. We are concerned that the commercialization of the Landsat system (and the meteorological system if the Administration decides to commercialize it) be accomplished in such a way that maximizes competition and economic efficiency. While some of these competitive concerns may not compel legal action by the Department of Justice, we feel the proposal should not be adopted without a good deal more study of its likely effect on the marketplace.

The Comsat proposal basically requests that Comsat be designated by legislation as the sole entity authorized to operate the Landsat system. The Comsat proposal would obligate the U.S. Government to purchase, under a long-term contract, all its land remote sensing data from Comsat. Moreover, Comsat asks for the additional guarantees of no other U.S. Government sponsorship of a competing venture, a similar long-term contract for operation of the meteorological satellite system and exclusive sales to the U.S. Government of weather data, and statutory provisions establishing, among other things, its proprietary rights to the resulting data.

The proposal appears to be based on an assumption that the service has the characteristics of a natural monopoly. To the best of our knowledge, such an assumption is as yet untested, and may prove to be unfounded, particularly in light of the proposals by Space Services, Inc. and American Science & Technology Corp., describing their plans to proceed with land remote sensing satellite

ENCLOSURE 3

systems. While it is impossible to predict, at this time, how competitive the markets involved in providing remote sensing data are likely to be, the assumption that a governmentally established monopoly is necessary to accomplish commercialization should be the subject of further consideration by the task force studying this issue.

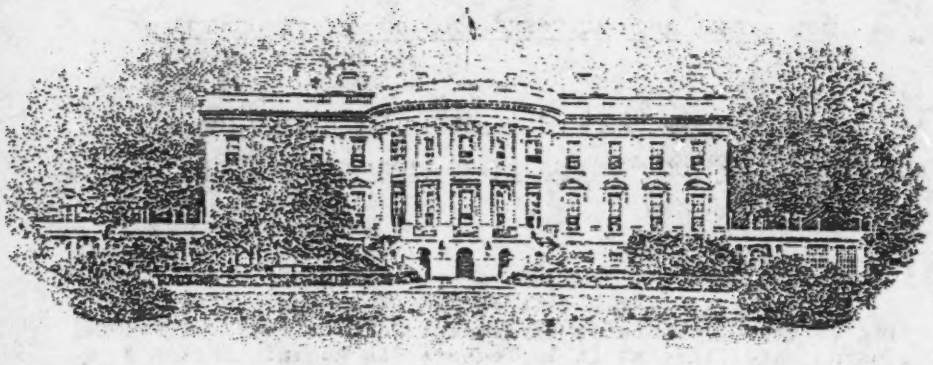
The Antitrust Division believes, moreover, that any transfer of these systems to the private sector should promote competitive conditions if possible. Accordingly, we believe that the task force should carefully consider the effect of any long-term government procurement commitments on entry conditions in the industry, and assure that the proposed commercialization of the government facilities does not create subsidies that discourage competition. In particular, since Comsat is entering other, competitive markets with such services as direct broadcast satellites, there could well be concerns that a monopoly position in the Landsat and meteorological satellite businesses would enable Comsat to charge high rates in those markets in order to subsidize services in competitive markets.

An additional important consideration in evaluating the options for commercialization of the Landsat system is that the gathering of the data and the preparation and analysis of the results need not be considered as a unified function. Depending on the mechanism used for commercialization, there may very well be companies such as Space Services, Inc. that have the ability to launch and operate a land remote sensing system, while others would have the expertise necessary to compile and analyze the resulting data into meaningful information. This possibility suggests on the one hand that the functions of owning and operating the Landsat system and the interpretation of the data should be considered separately. On the other hand, there could be substitutes for particular services that would warrant expanding the markets in which the competitive effects of commercialization might be felt.

Thank you for your inquiry. We hope to be participating in the resolution of these competitive issues as they proceed through the administrative and policy process.

Sincerely yours,

Ronald G. Carr
Deputy Assistant Attorney General
Antitrust Division



PRESIDENT'S PRIVATE SECTOR SURVEY ON COST CONTROL

TASK FORCE REPORT ON THE DEPARTMENT OF COMMERCE

SUBMITTED TO THE SUBCOMMITTEE FOR CONSIDERATION AT ITS MEETING ON APRIL 15, 1983

II. ISSUE AND RECOMMENDATION SUMMARIES (CONT'D)

F. NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION (NOAA)

COMMERCE 10: COMMERCIALIZATION OF CIVIL (NOAA) SATELLITE

Issue and Savings

Is it possible for NOAA to recover a substantial portion of the Government's investment in civilian land remote sensing satellites as it implements the Administration's plan to cease funding civilian land remote sensing activity by 1988?

We have developed recommendations that could yield savings/ revenue enhancements of $103 million in FY 1983, $170 million in FY 1984, and $224 million in FY 1985.

Background

NOAA's mission is to improve the safety and quality of life through better understanding of the earth's environment. The following chart shows budget obligations of the NOAA for the period FY 1981 through FY 1984B. Savings from this issue, as well as issues COMMERCE-11, "NOAA Mapping, Charting and Surveying Services," and COMMERCE-12, "NOAA Weather Radio," will reduce future budgeted expenditures as noted in the Savings section of each issue.

Table II-36

NOAA OPERATIONS, RESEARCH AND FACILITIES
($ millions)

	(1)	(2) Inc./(Dec.) From Prior Year	(3)
	Obligations	Amount	Percent
(1) 1981	$ 854.3	-	-
(2) 1982	945.8	$ 91.5	10.7 %
(3) 1983E	1,023.7	77.9	8.2
(4) 1984B	963.4	(60.3)	(5.9)

Within NOAA, the National Earth Satellite Service (NESS) currently manages the Nation's civilian weather satellite system and assumed responsibility in January 1983 for the Nation's civilian land remote sensing satellite system (LANDSAT), which is currently operated by the National Aeronautics and Space Administration (NASA).

Several civil land remote sensing satellites have been launched and operated by NASA since 1972. The data collected from these satellites are sold for nominal prices to Federal Agencies (e.g. the Department of Agriculture and the Department of Interior), state and local governments, foreign governments, and numerous private sector organizations. Applications include agricultural forecasting, mineral and petroleum exploration, and water and land use planning.

The Administration's budget estimates that of the $24.7 million required for LANDSAT operations in FY 1983, $9.8 million would be funded by reimbursements from various Federal Agencies using LANDSAT-D data (e.g., Departments of Agriculture and Interior, NASA) and the remaining costs of $14.9 million would be covered by fees from non-Federal users.

The most recent launch of a land sensing satellite (LANDSAT-D) occurred on July 16, 1982, and it is this satellite, along with the other major elements of the LANDSAT system, that NASA turned over to NOAA in January 1983. The package included the successor to LANDSAT-D -- LANDSAT-D' -- which is currently in storage, several ground stations, and data processing activities spread among several computer centers. The capital costs for LANDSAT-D and D' were $504 million; the requested outlays under NOAA for FY 1983 to 1986 are $156 million.

The White House Cabinet Council on Commerce and Trade, the OMB, and the Office of Science and Technology Policy (OSTP) have all recommended that the Government not finance the launching of any civilian land remote sensing satellites after LANDSAT-D has been replaced by LANDSAT-D' in the mid-1980s. They also recommend the elimination of Government-financed collection and dissemination of civilian land remote sensing satellite data after LANDSAT-D' ceases to function (probably in 1988). The early announcement of this policy was intended to permit a smooth transfer of the civilian land remote sensing activities to the private sector.

On April 27, 1982, the Secretary of Commerce appointed a 15-member advisory committee, composed of representatives from industry, state government agencies, and academia, to evaluate concepts for transferring ownership of the land sensing systems to the private sector. This group, the Land Remote Sensing Satellite Advisory Committee (LRSSAC), gave

vested interest groups an opportunity to provide input by issuing a Request for Information (RFI) through the Commerce Business Daily on September 10, 1982. The Committee then analyzed the 14 responses which the RFI generated and submitted its recommendations to the Secretary of Commerce on November 18, 1982.

Methodology

We interviewed the following:

- Assistant Administrator, NESS
- Deputy Assistant to the Deputy Secretary, Commerce Department
- Representatives of RCA Corporation
- Representatives of COMSAT General Corporation
- Representatives of Space Services, Inc.
- Representatives of American Science and Technology Corporation
- OMB personnel
- Various members of Commerce and NOAA Budget Staff.

We analyzed the following documents:

- Report of the Land Remote Sensing Satellite Advisory Committee (LRSSAC), November 18, 1982
- EARTHSTAR Proposal, COMSAT General Corporation
- NOAA Budget Submissions, FY 1983 to 1984
- Planning for a Civil Operational Land Remote Sensing Satellite System: A Discussion of Issues and Options, U.S. Department of Commerce, June 20, 1980.

Findings

The Land Remote Sensing Satellite Advisory Committee (LRSSAC) report (see Appendix Attachment I) comments on both major segments of the Government's civilian land remote sensing activities: (1) collecting and archiving raw data and (2) transforming the raw data into usable forms such as maps and charts.

Among other things, the report indicates there are virtually no barriers to the immediate commercialization of the second part of the activities -- the processing of raw data into usable forms. Currently, the NOAA budget for this kind of data processing is as follows;

($ millions)

	FY 83	FY 84	FY 85	FY 86
Data Processing Budget	5.8	19.8	23.8	23.8

Although the Government is willing to sell the entire LANDSAT system, no private sector firm has expressed interest in buying the whole system and running it as a commercial venture. According to the LRSSAC report, the reason the private sector has shown little interest in purchasing the LANDSAT system is that there is enormous uncertainty as to the economic value of the raw data it produces. Current prices are much more a reflection of operating costs than they are of the value of the data to users (value-in-use).

Given the lack of commercial interest in buying the LANDSAT system, the COMSAT General Corporation of Washington, D.C. delivered an unsolicited proposal to OMB (the Earthstar Document) in December 1981, which recommended that the Government immediately sell all facets of the civil land remote satellites and the civil satellites as a package to COMSAT.

The LRSSAC report also recommended that if satisfactory mechanisms cannot be found to commercialize all or part of the LANDSAT system, the Government, "in the best interests of the Nation," should continue to subsidize the land remote sensing activities.

William Spann of Metric, Inc. of Atlanta, Georgia, who is considered the leading authority in this area, estimates that Government revenues in FY 1982 from the sale of LANDSAT data were $12-15 million. He also estimates that the revenues of private sector firms which add value to the data and sell it to end users were $25-30 million in FY 1982. He further estimates that the revenues from both the Government and private sector firms selling the data could be as much as $200 million in FY 1985 and $400 million in FY 1990.

Conclusions

Based on the above findings, we have reached four conclusions:

First, since the private sector is willing and able to transform raw LANDSAT data into usable forms such as maps and charts, it seems logical that the Government should cease to be involved in these activities as soon as possible.

Second, a mechanism should be established to determine the full economic value of the raw data. There are obviously several ways to establish this value, but the one which seems most practical to us is as follows:

- The Government should sell to a private sector U.S. firm, at six-month intervals, the "right" to price the raw data which are transmitted from LANDSAT-D and LANDSAT-D'. The winner of the bid, the "LANDSAT pricer," should then have complete control of the prices for the raw data for six months and should get 70 percent of the revenue; the other 30 percent should go to NOAA. Anyone, anywhere, in any country should be free to buy the raw data at the established prices.

- Reselling the rights at six-month intervals would give firms a chance to assess and reassess the value of the data to them and to their competitors, their vulnerability to high prices, and the potential value of 70 percent of the revenues. The "LANDSAT pricer" would, like anyone else, be permitted to purchase raw LANDSAT data at the established price and would be free to compete with those firms which process and resell the data. In the case of the "LANDSAT pricer," however, the 70/30 percent split would not apply. The entire purchase price would go to the Government.

- This process would "smoke out" bidders from industries where the value-in-use of the data is high. If a firm knows the value of the data to its competitors is high, the appeal of 70 percent of the revenue would provide incentive to become the "LANDSAT pricer" and raise

prices. Falling demand at high prices (including zero demand at prices above value-in-use) would keep prices from increasing beyond their value-in-use for key applications.

- It is not inconceivable that prices for particular kinds of data (like those used for oil exploration) would escalate dramatically in a very few months and that tens if not hundreds of millions of dollars in revenue would flow to the "LANDSAT pricer."

- It is important to emphasize that the mechanism outlined here might put the price of the raw data out of the reach of several end-use applications. The large revenue from high value-in-use applications would, however, create an incentive for private sector firms to launch land remote sensing satellites and eliminate the need for the Government system.

Third, the concept of commercializing land sensing satellites and weather satellites as a package should not be pursued.

The Administration, as represented by OMB and the Cabinet Council on Commerce and Trade, has decided that non-defense Government needs for land remote sensing data are either not critical or can be acquired in some other way. Simply stated, the Government neither wants nor needs the civil land remote sensing system. Given this decision, eliminating land remote sensing or transferring it to the private sector will obviously reduce costs more than improving its efficiency by linking it with the civil weather system.

If the Administration changes its policy position and decides that further major subsidies of civil land remote sensing are justified, the possibility of commercializing civil land and civil weather satellites as a package should be evaluated. Otherwise, the commercialization of civil weather satellites should be evaluated on its own merits and should not be linked to the phase-out of Government involvement in civil land sensing.

Fourth, whether or not the Government's attempt to commercialize civil land remote sensing activities is successful, the Government should stick to its plan not to launch any civil land remote sensing satellites beyond LANDSAT D'.

In contrast to the Land Remote Sensing Satellite Advisory Committee, whose report we alluded to earlier, we do not think that the U.S. Government must commit itself "in the best interests of the Nation" to the continuity of a Government and/or private sector remote sensing system.

If a mechanism can be established to demonstrate that raw civil land data have a high commercial value, then it is highly likely that one or more firms will take the risk of launching a land remote sensing satellite that will satisfy the large/critical users of the data. Unencumbered by time-consuming Government procurement processes, it is highly likely that the private sector will be able to get a satellite in orbit by 1988 and be able to provide the data continuity that concerns many current processors and/or users of the data.

If, however, there is a delay in the launch of private sector land sensing satellites, and, therefore, a break in the continuity of the data, it is useful to ask:

Who suffers? How much?

How does the cost to processors/users compare with the cost the taxpayers must incur to guarantee continuity of the data?

In 1982 the combined Government and private sector revenues from land sensing satellites totaled $37-45 million: $12-15 million, and $25-30 million, respectively. If the LANDSAT data had not been available, this revenue would have been lost and the processors/users of the data would have suffered. This loss seems large, but it must be viewed in the context of the capital costs of LANDSAT D and LANDSAT D that same year, which were approximately $504 million.

If the Reagan Administration had not canceled LANDSAT-D'' and LANDSAT-D''', the originally proposed successors to LANDSAT-D', the budget for the LANDSAT program for 1983 through 1986 (as proposed by the Carter Administration) would have been $476 million higher than the phase-out Reagan budget. In broad terms, this difference is an estimate of what it would cost the taxpayers between 1983 and 1986 to guarantee data continuity beyond 1988. If the total vulnerability of the processors/users of that data is not substantially greater than the $37-45 million in revenues realized in 1982, justifying taxpayer subsidies of this amount is very difficult.

Although we do not have access to data on defense-related satellite programs, we assume that such programs exist and, therefore, that the elimination of civil land remote sensing would not eliminate all U.S. remote sensing capabilities. We were informed by the Commerce Department

that there are no defense-related activities which would bar sale of the LANDSAT system or data to the private sector.

Recommendations

We recommend that:

COMMERCE 10-1: The Secretary of Commerce should immediately take steps to eliminate Government involvement in any phase of land remote sensing beyond the collection and storage of raw unprocessed data. Specifically, the Government should cease to be involved in converting raw data into images (in the form of computer-compatible tape or film) and in processing and distributing image data.

COMMERCE 10-2: The Secretary of Commerce should establish a mechanism to determine the full economic value of raw LANDSAT data by selling the "right" to price the raw data.

Savings and Impact Analysis

If our recommendations are followed, operating costs would be reduced as a result of the phaseout of Government processing beyond the collection and storage of raw data. As noted earlier, NOAA's current budget for these processing activities is as follows:

($ millions)

	FY 83	FY 84	FY 85	FY 86
Data Processing Budget	$ 5.8	$19.8	$23.8	$23.8

Assuming some of the phaseout can be implemented in FY 1983, but that it will take until FY 1984 to complete the transfer of the functions to the private sector, the following savings should accrue:

Table II-37

SAVINGS/REVENUE ENHANCEMENTS

($ millions)

	(Year 1) FY 83	(Year 2) FY 84	(Year 3) FY 85	(Year 4) FY 86
Current budget	$ 5.8	$ 19.8	$ 23.8	$ 23.8
Recommended budget	3.0	0	0	0
Savings	$ 2.8	$ 19.8	$ 23.8	$ 23.8

In addition to these savings, the Government would receive revenue from the sale of the "right" to price raw LANDSAT data. For illustrative purposes, we have estimated the value of the raw data to be at least $400 million. This does not seem unreasonably high, given that William Spann of Metric, Inc., estimates that 1985 revenues for the industry, as it now operates, will be approximately $200 million and that 1990 revenues will approach $400 million. He agrees that if value-in-use pricing can be implemented, the near term revenues could easily reach $400 million.

Assuming that the Government does implement the "LANDSAT pricer" concept and the raw data can be sold (on a value-in-use basis) by FY 1986 for about $400 million annually, and that bidders for the "pricing rights" require a 40 percent pretax return on assets, the Government royalties and revenues from Government sales of "Pricing Rights" in FY 1986 can be estimated as follows:

Table II-38

PRICING RIGHTS FY 1986
($ millions)

	FY 86	
Total revenue from sale of raw data	$400	
Less 70% royalty to LANDSAT pricer(s).....	(280)	
Government royalties.....		$120
LANDSAT pricer royalty.....	$280	
Less profit required by LANDSAT..... pricer (given 40% return target)	(80)	
Revenues from government sales of "pricing rights"*		200
Total government LANDSAT revenues by FY 86....		$320

* These revenues would be the bid price paid by the LANDSAT prices for the right to price LANDSAT data.

Given NOAA's current plan for selling raw data which calls for $46 million in sales in FY 1986, $320 million would be a $274 million enhancement in revenue in FY 1986. We estimate the buildup to $274 would occur as follows:

($ millions)

	(Year 1) FY 83	(Year 2) FY 84	(Year 3) FY 85	(Year 4) FY 86
"New" LANDSAT revenue	$ 100	$ 150	$ 200	$ 274

In total, then, the savings from reducing the data processing costs and the revenue enhancements from selling the raw data under the LANDSAT pricer concept would be as follows:

($ millions)

	(Year 1) FY 83	(Year 2) FY 84	(Year 3) FY 85	(Year 4) FY 86
Annual savings	$ 3	$ 20	$ 24	$ 24
Revenue enhancement	100	150	200	274
TOTAL	$103	$170	$224	$298

Implementation

COMMERCE 10-1: The President should immediately instruct the Secretary of Commerce to take steps to eliminate Government involvement in any phase of land remote sensing beyond the collection and storage of raw unprocessed data. The Secretary, in turn, should immediately draw up and execute a Transition Plan which addresses such issues as the disposition of equipment, the cancellation of data processing service contracts, and the dismissal or relocation of the staff involved in the downstream operations.

COMMERCE 10-2: The President should immediately instruct the Secretary of Commerce to take steps to sell the "right" to price the raw data which are transmitted from LANDSAT-D and LANDSAT-D'. The Secretary, in turn, should immediately prepare and issue a Request for Proposal consistent with Recommendation COMMERCE 10-2.

Additional Information

For additional information, see the following attachment to section II-F-1 of the Appendix:

Attachment I Report of the Civil Land Remote Sensing Satellite Advisory Committee, November 1982

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BRIEFING

ON

NATIONAL SECURITY REQUIREMENTS AND MILITARY CONCERNS TO BE ADDRESSED AND RESOLVED PRIOR TO TRANSFERRING CIVIL SATELLITE SYSTEMS TO THE PRIVATE SECTOR (U)

Prepared Jointly by the DoD and DCI Representatives to the
INTERAGENCY BOARD ON
CIVIL OPERATIONAL EARTH-OBSERVING SATELLITE SYSTEMS

Presented by

Colonel Vernon M. Malahy, Jr., USAF

Chairman, Joint Environmental Satellite Coordinating Group

OUSDRE

[Material in this packet is unclassified. Discussions on the material and the briefing on the material will include SECRET information]

"NATIONAL SECURITY REQUIREMENTS AND MILITARY CONCERNS
TO BE SATISFIED IN A TRANSFER OF CIVIL
METEOROLOGICAL SATELLITE SYSTEMS TO THE PRIVATE SECTOR" (U)

TERMS OF REFERENCE (U)

(U) Prerequisite to any transfer, lease or commercialization of the existing and future U.S. Meteorological satellites and satellite systems outside of the U.S. Government for operation, ownership or other mode of private sector control, it is mandatory that:

- (U) there be no compromise which will lessen or negate the national security of the United States of America;
- (U) there be no impact on the U.S. Military-Civil Government interface in the exchange, processing, control, design, or development of weather satellite data, data acquisition, or satellite systems. This shall preclude acquisition of dissimilar equipment or the requirement for significant modification of hardware or software currently in use, or programmed for use, by the military forces;
- (U) the Department of Defense maintain the relationship with the National Oceanic and Atmospheric Administration as the only U.S. Civil Government source and point of contact for civil operational meteorological raw and processed data, data acquisition, technology sharing and exchange, system control and development, and representation to the international and world meteorological community;
- (U) there be no disruption in the international free exchange and flow of weather information or scientific cooperation as established by historical precedence, existing treaty, or participation in international operational or technical organizations;
- (U) there be no obligations placed on the U.S. Government to provide launch or range services, or other operational support; and,
- (U) selection of the private entity occur under conditions of competition among U.S. firms only.

"NATIONAL SECURITY REQUIREMENTS AND MILITARY CONCERNS
TO BE ADDRESSED AND RESOLVED PRIOR TO TRANSFERRING
CIVIL LAND SATELLITE SYSTEMS TO THE PRIVATE SECTOR" (U)

TERMS OF REFERENCE (U)

(U) Prerequisite to any transfer, lease or commercialization of the existing and future U.S. civil land remote sensing satellites and satellite systems outside of the U.S. Government for operation, ownership or other mode of private sector control, it is mandatory that:

- (U) there be no action taken that would be detrimental to the national security of the United States of America;
- (U) there be no disruption in the orderly flow of land imagery data to meet the needs of the organizations of the U.S. Government involved in national security matters;
- (U) there be no obligations placed on the Department of Defense without the consent of DOD; and,
- (U) selection of the private entity (or entities) occur under conditions of competition among U.S. firms only.

OVERVIEW

- INTRODUCTION
- NATIONAL SECURITY CONCERNS
- ISSUES

INTRODUCTION

- DEPUTY SECRETARY OF DEFENSE LETTER
- SECRETARY OF COMMERCE RESPONSE
- CURRENT DOD POSITION

NATIONAL SECURITY CONCERNS

- SYSTEM DESIGN, CONTROL AND OPERATIONS
- DATA CONTROL
- TECHNOLOGY TRANSFER
- FREE FLOW OF WEATHER DATA
- SUPPORT AND SERVICES

- SYSTEM DESIGN, CONTROL AND OPERATIONS

  - DESIGN REVIEW PRIOR TO PRODUCTION
  - CONTINUITY OF DATA AS CURRENTLY AVAILABLE
  - DOD CONTROL
  - BACK-UP TO DEFENSE SYSTEMS
  - PRIORITY DATA NEEDS

- DATA CONTROL

- DATA DISTRIBUTION

- DATA PREVIEW

- TECHNOLOGY TRANSFER
  - TRANSFER
  - EXPORT
  - DEVELOPMENT

• FREE FLOW OF WEATHER DATA

- LONG STANDING INTERNATIONAL FREE EXCHANGE
- DOD WEATHER SUPPORT RELY ON INTERNATIONAL DATA

• SUPPORT SERVICES

- TYPES OF SUPPORT
  - BOOSTERS
  - LAUNCH SUPPORT
  - TRACKING
  - COMMAND AND CONTROL
- REIMBURSEMENT
- NO OBLIGATION ON THE GOVERNMENT

ISSUES

- SENSOR DEVELOPMENT
- DATA DISTRIBUTION
- SYSTEM CONTROL
- FREE FLOW OF DATA
- AVAILABILITY OF BOOSTERS

U.S. DEPARTMENT OF COMMERCE
CHARTER FOR
SOURCE EVALUATION BOARD ON
CIVIL SPACE REMOTE SENSING

Establishment:

The Secretary of Commerce, having determined that it is in the public interest in connection with the performance of duties, imposed on the Department by law and the President's Decision of March 8, 1983, to evaluate the transfer of the operational civil weather and land remote sensing satellites to the private sector, hereby establishes the Source Evaluation Board on Civil Space Remote Sensing (the "SEB").

Objectives and Duties:

1. The SEB will develop and issue a Request for Proposals (RFP) for the transfer of the Department's weather and land remote sensing satellite systems to the private sector.

2. The RFP issued by the SEB will allow for separate proposals on Landsat, the polar orbiting weather satellites, and the geostationary weather satellites and proposals for combinations of these systems. The RFP also may allow proposals for major segments of either system.

3. The SEB will evaluate the proposals submitted in response to the RFP approved by the Secretary of Commerce, and report its findings to the Secretary of Commerce.

4. In carrying out its responsibilities, the SEB will ensure that:

(1) National security and foreign policy concerns are resolved or referred to the Interagency Board on Civil Operational Earth-Observing Satellite Systems (IB-COESS);

(2) Data that the National Weather Service needs to offer the public the services it now provides are guaranteed; and,

(3) Evaluation of financial and program data is presented in such a manner that proposals for parts of the systems can be meaningfully compared with proposals for the entire system.

Members and Chairperson:

1. The SEB will consist of a Chairperson appointed by the Secretary and members representing the Department of Commerce and interested Federal agencies.

2. The Chairperson will be designated by the Secretary. The other members of the Board will be designated by the Chairperson.

3. The SEB will have a non-voting Secretary, and such other non-voting members as shall be designated by the SEB Chairperson.

4. The members will be appointed for eighteen month terms and will serve at the discretion of the Secretary or Chairperson.

Administrative Provisions:

1. The SEB will report to the Secretary or his designee. Prior to delivering its final report to the Secretary, the SEB will brief principals of IB-COESS on its findings so they may brief their superiors. The IB-COESS may request additional information from the SEB and it may provide comments on SEB findings to the Secretary.

2. The SEB will meet on a schedule established by its Chairperson. Department of Commerce members will be assigned full-time to the work of the SEB. The Secretary will request the heads of other agencies with representatives on the SEB to detail those members to the work of the SEB on a full-time basis.

3. The National Oceanic and Atmospheric Administration will provide clerical and other necessary support services for the SEB.

4. The SEB may establish such working groups of non-members from Federal agencies as may be necessary to its operation.

Duration:

The SEB shall expire eighteen (18) months from the date of this charter unless earlier terminated or properly renewed.

JUN 2 0 1983
Date

Secretary of Commerce

DELEGATION OF AUTHORITY

I hereby delegate, to the Chairperson of the Department's Source Evaluation Board for Civil Space Remote Sensing, authority to make initial determinations to grant or deny public access to records in the possession of the Board or its supporting staff and committees in response to Freedom of Information Act requests. In the absence of the Chairperson, this authority may be exercised by the Secretary of the Source Evaluation Board or its Legal Advisor.

JUN 2 0 1983
Date

Secretary of Commerce

THE SECRETARY OF COMMERCE
Washington, D.C. 20230

JUN 2 0 1983

MEMORANDUM FOR Raymond G. Kammer, Jr.
Deputy Director, NBS

SUBJECT: Source Evaluation Board on Civil Space Remote Sensing

I am pleased to appoint you Chairman of the Source Evaluation Board on Civil Space Remote Sensing.

As Chairman, you will ensure that the Source Evaluation Board will conduct its business in accordance with the provisions of the Source Evaluation Board Guidelines and Charter. You also have the responsibility to determine that each Board Member (both voting and non-voting) is fully conversant with the instructions contained in the guidelines, particularly the instructions concerning conflict of interest matters.

The findings of the Source Evaluation Board are crucial to my final decision. The findings must provide sufficient detail for me to evaluate alternatives. All acceptable proposals should be evaluated, ranked, and reported. The Board's written findings should be professional, thorough, and not consider elements which are extraneous to the objectives of the evaluation process.

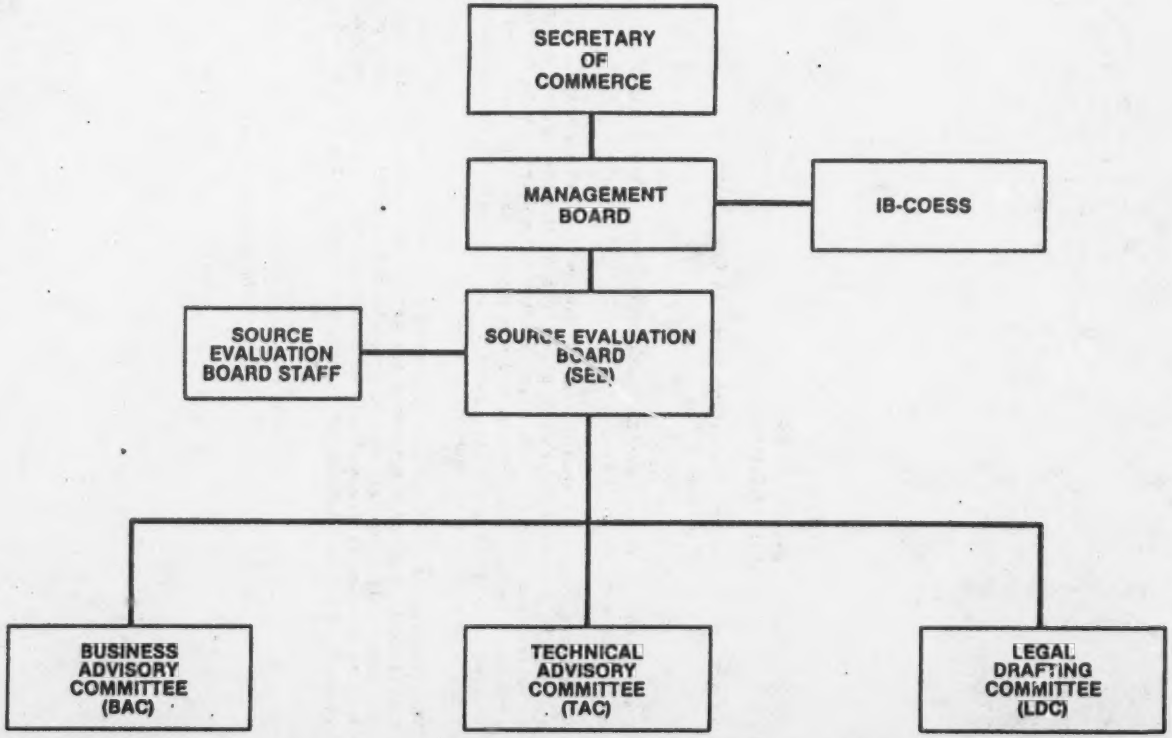
Malcolm Baldrige

Secretary of Commerce

20-901 O - 84 - 77

U.S. DEPARTMENT OF COMMERCE

SOURCE EVALUATION BOARD FOR CIVIL SPACE REMOTE SENSING



SOURCE EVALUATION BOARD

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Lisle Rose	State	OES/SAT Department of State 21st and C Street, N. W., Room 4333 Washington, D. C. 20520 Telephone: 632-2433
Col. Quentin Wilkes	USAF	Deputy Director of Airstaff System Air Force Data Services Center AFDSC/GL, Room 3A153, Pentagon Washington, D. C. 20330 Telephone: 695-1843
Joseph M. Levine	Commerce	Deputy Assistant General Counsel for Administration/General Law Department of Commerce Room 5886-C Washington, D. C. 20230 Telephone: 377-5391

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DOC Commercial Use Process
April 13, 1983

INTERAGENCY BOARD
ON
CIVIL OPERATIONAL EARTH-OBSERVING SATELLITE SYSTEMS

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COE
Mr. Robert K. Dawson
Deputy Assistant Secretary of the Army
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Washington, D. C. 20310
(202) 697-4671

EARTH SATELLITE CORPORATION *(EarthSat)*

7222 47th STREET, CHEVY CHASE, MD, USA 20815
951-0104
TELEPHONE: (301) [illegible] TELEX: 248618 ESCO UR

April 27, 1983

Dr. Robert E. Palmer
Science Consultant
Committee on Science and Technology
U. S. House of Representatives
388 HOB Annex 2
Washington, D. C. 20515

Dear Dr. Palmer:

As I mentioned during our meeting last week, EarthSat has several concerns about the proposed commercialization of land remote sensing. Our first concern relates to the Commerce Department's proposed Request for Proposal, which according to Secretary Baldrige's testimony of April 14, will require proposals for whole systems (from satellite through data delivery) and will not permit proposals for parts of the whole. We are in the value-added service business for remotely sensed data, and have been since 1969. However, we can see a strong possibility that we and others like us might be squeezed out completely during the commercialization process as the Commerce Department apparently perceives it. This would happen if any type of monopoly were permitted which provided value-added services as well as raw data. Even if data were to be made available in a non-discriminatory way to other groups, the main owner/operator would still possess a big advantage if they were allowed their own value-added service component. Restricting the operator from moving into value-added services (as the EROS Data Center is now restricted) would protect groups like us. We believe, however, that the language of the agreement between the government and owner/operator must be most carefully worded to prevent loopholes or freedom of interpretation.

Our second concern relates to data access. Some bidders are likely to seek copyrights on land remotely sensed data. We believe that this will severely hinder the development of value-added service groups. We would therefore like any commercialization to guarantee the same rights to use, manipulate, copy and distribute data as are currently permitted under U.S. Government operation. Should copyright prove a sine qua non for commercialization, then such copyright should be granted only through the "raw" data, leaving full freedom to permit value-added service companies to operate as they operate now. Note that we are not objecting to price increases, which any owner/operator may find necessary in order to have a commercial proposition. We are much more worried that our rights to use purchased data may be reduced. Naturally, we believe price increases should be carefully legislated should the commercial owner/operator enjoy a defacto monopoly on Landsat data. This will be particularly important as the value of additional special processing of data increases.

Our third concern is more general. We do a good deal of work with the French and Japanese, helping them to define their land remote sensing programs. We are concerned that, having led in this field since the early 70's, the United States seems ready to let our own program die. Regardless of commercialization, a strong continuing research program, including a flight program for a successor to Landsat-D', is essential. Since such a program would involve state-of-the-art technology, employ the talents of university, government and industry investigators, and have a meager production capacity and long analysis process, we regard such a program as non-commercial. The right place for it is NASA. To have such a new satellite and sensor flying by the late 80's, the effort should be starting up now. Although money is being spent on analysis and sensor development, we believe there will be little progress unless the effort is concentrated and focused on some definite flight program involving a new U.S. satellite. We know of no plan to propose such a flight program, though the capability and desire certainly exist already within NASA.

If the opportunity presents itself, we would like to meet with Congressman Scheuer, Congressman Volkmer and others of the Science and Technology Committee to present our thoughts and concerns in more detail. We would also welcome the chance to describe these to the appropriate full subcommittees.

Yours sincerely,

Charles Sheffield

Charles Sheffield
Vice President

cc: Dr. Radford Byerly, Jr.
Committee on Science and Technology
U. S. House of Representatives
Suite 2321 Rayburn Building
Washington, D. C. 20515

THE SECRETARY OF COMMERCE
Washington, D.C. 20230

June 29, 1983

Honorable Don Fuqua
Chairman, Committee on
Science and Technology
House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

This letter addresses the issue of how the Department of Commerce proposes to satisfy its obligations under Section 202 of H.R. 2065, the "Bateman Amendment."

Under that amendment I cannot transfer the ownership or management of any remote space satellite system until I provide to the Congress "a comprehensive statement of recommended policies, procedures, conditions, and limitations to which any transfer should be subject," and "thereafter Congress enacts a law" providing a policy framework for the transfer.

Until we actually receive proposals from industry for the commercialization of Landsat, Metsat or both, we will not be in a position to provide the comprehensive report required by Section 202.

We plan therefore to proceed in the following manner:

(1) Working closely with the appropriate House and Senate committees, the Source Evaluation Board will draft the Request for Proposals (RFP). At each stage in that process, before decisions are made, we will consult with your committee in whatever detail it desires. We will consult as each issue is taken up, for example, as we reach decisions on the details of the international commitments under which Metsat would be operated commercially. In addition, if you wish we will consult with the committee periodically on a fixed time schedule.

(2) We will then discuss the RFP with industry, getting whatever preliminary advice they have. We will again consult with the committee after this stage.

(3) We plan to release the RFP to industry in mid-November. It will be flexible enough to permit industry to be innovative in drafting their proposals on commercialization.

(4) Given proposals from industry in response to the RFP, we will then be able to make recommendations on whether commercialization of either Landsat or Metsat is feasible and under what policy and operational constraints. At that point we will be in a position to submit the comprehensive report required by Section 202 and to recommend framework legislation. We hope to be able to do that early in the second session of the 98th Congress.

Let me stress two additional points:

(a) The RFP will specify upfront that no contract can be awarded until Congress passes legislation as required by Section 202.

(b) We are committed to work with the Congressional committees closely throughout this entire process. We specifically invite any comments the committee has now on policies, procedures, conditions, and limitations which in your view should be considered in the RFP process.

I hope the foregoing approach is acceptable to you.

Sincerely,

Secretary of Commerce

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUITE 2321 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, D.C. 20515
(202) 225-6371

October 25, 1983

Honorable Malcolm Baldrige
Secretary of Commerce
U.S. Department of Commerce
Washington, DC 20230

Dear Mr. Secretary:

Pursuant to our agreement to provide advice to your Source Evaluation Board (SEB) for civil remote sensing, we have analyzed those parts of the draft Request for Proposals (RFP) that have been submitted to us as of October 3.

We have examined the RFP in light of the April 14, 1983, joint hearing of the Subcommittee on Natural Resources, Agriculture Research and Environment and the Subcommittee on Space Science and Applications, when you expressed the view that the RFP process would generate considerable additional information concerning the commercial value of civil remote-sensing satellites. Now, with the draft RFP in hand, we must seriously question that view.

Although the efforts of the SEB have been notable, the Board continues to operate in such a way that U.S. industry, through its responses to the RFP, would do more than provide information; in fact, it would define government policy. Like you, we retain a healthy pride and respect for the creativity and vitality of U.S. industry. However, it is clearly the role of the Congress to set policy -- that is, for example, to judge the anti-competitive potential of control of data by a single operator, or to assess if weather satellites are too important to the nation's security to be commercialized, or to determine whether we as a Nation should continue to adhere to an "open skies" policy which has served us well in international relations for twenty years. These are fundamental policy questions which affect real and vital interests of the American people, and they should be resolved before U.S. industry is asked to respond to an RFP.

Our first, and perhaps greatest, specific concern is related to the inclusion of weather satellite systems in the RFP. According to your testimony before our Subcommittees in April, one reason that weather satellites were to be included in the RFP was to allow the private

sector a freer hand in the marketing of weather data. The SAB, in the meantime, has recognized the desirability of maintaining the U.S. policy of free international exchange of weather data. Although we applaud this policy, it clearly precludes any possibility for increased commercial marketing of weather information beyond that which is already achievable under government operation. If "commercialization" of weather satellites would not increase marketing, we are left with the same questions which were so troubling to the President's Private Sector Survey on Cost Control, to the "Peck/Charles" panels, and to the Advisory Committee on Land Remote-Sensing: viz. what is to be gained from commercializing a system which is inherently governmental? What possible gains justify the risks we would create in the areas of national security, public safety, cost-overruns, and possible antitrust violations? Finally, why divert time and resources from the issue of commercialization of land remote-sensing, when there is a clear consensus in the Congress that the concept of weather satellite commercialization should be summarily dropped?

Our second concern relates to whether the RFP is structured so as to generate substantial new information about various modes of commercial operation. The requirement that proposals encompass entire satellite systems (space, ground, and product development segments) forecloses information about the full range of commercial options. Although we recognize the difficulty of comparing bids on entire systems with bids on segments of systems, it seems injudicious to eliminate out of hand the commercialization option which has drawn widest public support -- namely, the phased commercialization of land remote-sensing systems. Further, due to the difficulty of ascertaining and describing Federal user requirements in the RFP, it is clear that industry will only be able to respond with a variety of "cost-plus" bids, which makes it difficult to see how the RFP process can give substantial insight into the future scope or cost of operations.

Third, in many crucial areas, the RFP fails to describe adequately what is being required. For example, in Section VII 8.3(d)(2) a proposer is required to "hold himself in readiness" to sell unspecified data to the Government. This would not allow proposers to estimate in a meaningful way the actual cost of the requirement. Examples of this sort are frequent enough to reinforce our concern about the amount of information which can be gained from the solicitation of "cost-plus" bids.

Fourth, with respect to land-viewing satellites, the "open skies" policy has served us well for many years and has been an integral part of our foreign policy. Making this policy optional would, in our view, cause significant damage to the U.S. position in international fora. It is appropriate to recall some relevant policy declarations by the Congress, the President, and others which place this matter in context. The National Aeronautics and Space Act of 1958 explicitly states that "activities in space should be devoted . . . for the benefit of all mankind". The President's 1982 report to Congress entitled Science, Technology and American Diplomacy stresses that "readily available products of U.S. . . . land satellites . . [have resulted in] a large measure of goodwill and support of our positions in the U.N. and other international fora." The U.S. statement at Unispace '82 echoed this theme, and described benefits of "accessible" Landsat data as "indispensable to understanding and employing earth resources for the benefit of mankind".

Fifth, we are concerned that the decision to allow a satellite operator to enter the value-added sector without restrictions has not been fully considered and could harm an existing industry. The sellers of value-added, land remote-sensing products currently generate considerably more revenue than does the government by its sale of raw Landsat data. These entrepeneurs are also the key to commercial development of the land remote-sensing data market. Any decision which might harm this industry should be made only after careful review of all viewpoints, and we have seen no evidence that such a review has in fact been performed.

To summarize, a minimally acceptable RFP should at least --

a. remove weather satellites from consideration;

b. allow phased commercialization by function;

c. encourage a commercial, market-driven bid rather than a cost-plus bid;

d. require "open skies" as a firm condition; and

e. explicitly protect competition in the value-added industry.

We support the fundamental concept of commercialization and we look forward to the innovation and efficiency that private sector involvement can achieve. There is little justification, however, in asking American industry to expend their resources to respond to an RFP that has so little chance of success. Again, we stress that

these criticisms are not aimed at the work of the SEB itself, but rather at the thesis that solicitation in advance of clear, legislated policy will accomplish the desired goals.

We will be happy to work with you in drafting legislation that will promote appropriate commercialization on a sound basis. We are certain that you share our concern for the preservation of the public good that these remote sensing capabilities represent.

Sincerely,

JAMES H. SCHEUER
Chairman
Subcommittee on Natural
Resources, Agriculture
Research and Environment

HAROLD L. VOLKMER
Chairman
Subcommittee on Space
Science and Applications

DEC 9 1983

THE SECRETARY OF COMMERCE
Washington, D.C. 20230

DEC 6 1983

Honorable Harold L. Volkmer
Chairman, Subcommittee on Space
Science and Applications
Committee on Science and Technology
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

Thank you for your cosigned letter regarding the five points which you raised on the commercialization of the weather and land satellite systems. They are as follows:

Remove Weather Satellites from Consideration

The language in the Commerce FY 1984 Appropriation Bill prohibiting further expenditure of funds for commercialization of the weather satellites makes this a moot issue.

Allow Phased Commercialization by Function

This may prove to be the best approach. We prefer to sell the Landsat system as a block. If we separate the functions, it is likely that there will be no bids for the high cost functions of fabrication, launch, command and control. All bids are likely to be for data analysis and marketing. This would leave the Government, perhaps permanently, financially responsible for the rest of the system.

Encourage a Market-driven rather than Cost Plus Bid

You are right. We will change the RFP to encourage a market-driven bid.

Require "Open Skies"

Nondiscriminatory access to data is the preferred practice for Landsat. I am reluctant to make this a firm condition however, until we understand better the commercial impact of this requirement. Although Spot Image has stated a non-discriminatory data policy for their first two satellites, they have not defined the policy. We do not know what the

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Japanese will do. Sparx apparently plans a discriminatory data policy. The market implications of this policy should be tested in the RFP before making a final decision.

Protect Competition in the Value Added Industry

I agree with this objective. I think the pertinent language in your draft Landsat legislation is interesting. We will ask the Department of Justice for advice regarding use of a similar approach in the RFP.

As we agreed recently, the Department of Commerce will provide technical advice on your draft Landsat legislation. Thank you for the attention to this issue.

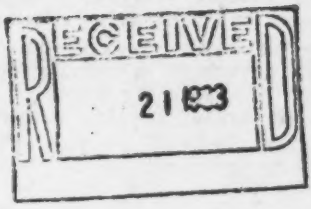
Sincerely,

Malcolm Baldrige

Secretary of Commerce

COMMUNICATIONS SATELLITE CORPORATION

November 21, 1983



Mr. Raymond G. Kammer
Chairman
Source Evaluation Board
for Civil Space Remote Sensing
North Bethesda Office Center No. 1
Room 300
11420 Rockville Pike
Rockville, Maryland 20852

Dear Mr. Kammer:

We have carefully reviewed the draft RFP and have a number of comments for your consideration. As you know, COMSAT has advocated the commercialization of the Government civil weather and land remote sensing satellite systems for a number of years. The EARTHSTAR concept, first proposed in 1981, was founded on the premise that a combined commercial weather and land system would provide the Government with a better quality of service, at less total cost to the taxpayer than is possible with a Government system.

However, Congress has made a decision that the weather satellites shall not be commercialized. Consequently, we have decided against making a bid which would include the weather satellites. It is extremely unlikely that any bids on the weather satellites will be forthcoming. Therefore, we question the desirability of including the polar and geosynchronous weather satellite systems in the Final RFP. Our remaining comments therefore are directed to the Draft RFP as it relates to LANDSAT.

In many respects the draft RFP would make important progress toward the establishment of a truly commercial system. For example, your recognition of the necessity of the commercial operator owning the data is extremely important. However, if your goal is as you state, "viable commercial operation", we believe the Draft RFP is inconsistent with a viable commercial operation.

It appears, to us that the process of coordination resulted in each Executive Agency inserting its requirements into the Draft RFP without sufficient focus on the effect of such multi-layered approach.

The resulting RFP is one which would not result in a commercial system, but perpetuate the present Government system under the guise of private operation. Furthermore, if data must be provided to the Government for foreign data exchanges and for domestic R&D, it would appear that foreign and domestic commercial opportunities would be severely curtailed. At the same time the Draft RFP states that no "firm estimates" of images or CCT's that might be purchased are possible. In other words, the Agencies demand that certain "requirements" be met, but that they are unwilling state how the cost for doing so will be met. We question the commercial opportunity in such a situation.

Further, the LANDSAT system is not an ideal system to commercialize. As you state in the Draft RFP, the LANDSAT D satellite system is an experimental, not an operational, system. That is not to say that the technical achievements in developing the LANDSAT system are not significant -- it is an impressive technical achievement. Nevertheless, it cannot compete with inexpensive solid state technology. In short, no business based on the LANDSAT heritage could be successful without a large Government subsidy.

We understand that the Administration does not want a large Government subsidy of commercial remote sensing. As you have stated on page i-3 of the Draft RFP "the Government would prefer to buy the data over the counter as the need for data arises." Therefore, the RFP and Government actions should be focused not on commercializing LANDSAT but on creating conditions necessary for truly commercial remote sensing businesses to start-up and provide the multitude of sources of data which will allow "over the counter" Government purchases.

We believe the best approach given the circumstances, would be to continue operation of LANDSAT 4 and D' within the Government as R&D programs through 1986 or 1987. No Government expenditures for a follow-on system should be made, Rather, private industry should be encouraged to supply the remotely sensed data required by the Government after 1986. To make this possible, the Government must state its "firm estimates" of the type and quantity of data and data products it would buy.

The reason we believe that it would not be desirable to transfer the existing LANDSAT system (including the LANDSAT D' satellite scheduled to be launched in 1984) is that the process of the transfer will likely extend well into the useful life of the LANDSAT space segment. The issuance of the RFP, response and resulting negotiations would extend well into the election activities next year and make it unlikely that the necessary legislation could be enacted until late 1985 or perhaps 1986. At that point, with only a year or so of useful life remaining, it would probably make more sense not to

change the system operator since the transaction costs to the Government and industry would exceed the potential benefits. We therefore recommend that no RFP be issued for transfer of the LANDSAT system, and that the equipment remaining at the end of the useful life of the system be disposed of as surplus property pursuant to existing Government procedures.

The Government must then take two actions to ensure that private sources of data will exist so that "over the counter" purchases will be possible by 1987 or 1988. The first action must be to ensure that no Government competition with private systems will exist after LANDSAT D'. Private investors must have reasonable assurance that their investment will not be undercut by a competing Government system. Secondly, the Government must give industry a firm indication of how much data it wants "over the counter".

Given these two actions by the Government, industry will respond to the market with systems which are cost effective and meet the true requirements. Subsidies and guaranteed contracts would probably not be required.

As you know, COMSAT is participating in a joint venture known as SPARX, to develop a low-cost remote sensing satellite system. If the development of SPARX is commercially successful, SPARX will be in a position to supply the Government with high resolution, multispectral stereoscopic data over the counter by 1987 at a cost significantly lower than is possible using the LANDSAT heritage technology. We would hope that the Administration would be supportive of the commercial development of such a system.

Should the Administration nevertheless decide to issue an RFP, the RFP should be amended to allow a SPARX bid. For example, the draft RFP is unclear whether a bid to supply data to the Government after LANDSAT D would be considered without a takeover of the LANDSAT system. We believe bids for supplying data in lieu of a continuation of LANDSAT should be encouraged and considered. Therefore, we suggest that the RFP be amended to make such bidding possible.

In amending the RFP to expressly solicit such bids, the SEB should clearly indicate which requirements apply to the LANDSAT takeover bid and which apply to a post-LANDSAT data contract. We submit that the majority of the proposal requirements should not apply to a post-LANDSAT data contract.

The RFP as it presently stands, would preclude a bid to supply SPARX data even though SPARX is a U.S. Corporation, has its principal place of business in the U.S., is sixty percent U.S. owned and SPARX is a "domestic concern" as defined by the Defense

Acquisition Regulations 6-001.7(a). The Government should not preclude itself from obtaining SPARX data because of a minority foreign interest in SPARX, or because SPARX is a new business.

In conclusion, we believe the best course of action, given the circumstances, would be to terminate the SEB RFP process and begin to encourage development of truly commercial remote sensing systems to meet the data needs of the Government after LANDSAT D' ceases to operate.

Sincerely,

Dr. John L. McLucas
Executive Vice President

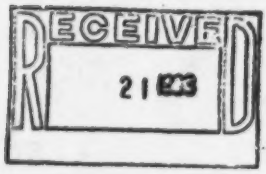
JLM:cdk

1203

SPACE AMERICA
4401 EAST-WEST HIGHWAY, SUITE 501
BETHESDA, MARYLAND 20814
(301) 656-0434

November 21, 1983

Mr. Ray Kammer, Chairman
Source Evaluation Board for
Civil Remote Sensing
NBOC #1, Room 300
11420 Rockville Pike
Rockville, Md. 20852



Dear Mr. Kammer:

On behalf of Space America, I am enclosing comments on the draft "Request for Proposals for Transfer of United States Civil Operational Remote Sensing Satellites to the Private Sector", as requested in your October 21, 1983, letter.

With respect to the questions raised in your letter, our response is as follows:

- We believe that the overall market, not the Federal market, should drive a commercial Landsat program and applaud your efforts to achieve this goal. However, in several instances, the RFP appears to state the Federal government's future needs and desires in terms of hard requirements. This is very confusing. See more detailed comments.

- The Federal government's purchases of data should not be restricted to any one supplier. However, the data it acquires should be restricted to internal Federal government use. In addition, the data it acquires for R&D or international assistance purposes should not be redistributed by principal investigators or by recipient foreign governments.

- We strongly believe that the RFP should be silent with respect to market structure. Specific marketing arrangements should be left to commercial owner/operators.

- The split between using Federal government assets and future data purchases is clear. We welcome the opportunity to propose an innovative transition approach. See more detailed comments.

- We will answer your question about good business arrangements for the follow-on activities in our response to the RFP itself.

- We believe that rigid contract terms will be self-defeating. See more detailed comments.

- o We applaud your concept of minimum Federal government involvement outside the contract itself. We are not clear that this approach is as yet fully realized in the RFP. See more detailed comments.

If we can be of any further assistance to you in the preparation of the RFP, please do not hesitate to contact us. We look forward to receiving the final RFP when it is released.

Sincerely yours,

Diana H. Josephson

Diana H. Josephson
President

Enclosure

November 21, 1983

SPACE AMERICA'S COMMENTS ON THE DRAFT
REQUEST FOR PROPOSALS

OVERALL

1. A separate RFP should be prepared for the Landsat system so that there is no ambiguity as to the requirements that must be met by offerors.

2. The Landsat RFP should be consistent with the draft Landsat commercialization legislation now being considered by the Congress. For example, the evaluation criteria in the RFP and the legislation are not consistent so that offerors cannot be assured that the entity selected by the Administration will also qualify under the legislation. Similarly, the terms of the contract are not identical and archiving requirements differ. It is not clear whether the Federal government is going to continue the "open skies" policy, as the draft legislation provides, or permit proprietary data, as suggested by the RFP. The term "transition period" is used very differently in the RFP and in the draft legislation. The bill makes it clear that offerors should be capable of generating MSS-type data and that government R&D should not compete with commercial operators. The RFP is silent on these issues.

3. We disagree that the "heart" of the solicitation is the technical proposal. We believe that the "heart" of the Landsat solicitation is to commercialize land remote sensing from space. The RFP, insofar as it refers to Landsat, has been overly impacted by the inclusion of the Metsats, where clearly the first statement is true.

We recommend that Section VII and Section VIII be reversed, and that the phrase "Government Contract Experience" be dropped from Section VIII's title, in order to emphasize this point.

4. Current Section VII is very confusing. This confusion seems to result from the fact that Section VII governs the technical aspects of both the bid for the takeover of the existing Landsat D system and the bid for the follow-on commercial system, but never differentiates clearly between these two very different phases of the Landsat commercialization process in its statement of the technical ground rules for a bid. This confusion is compounded by the inclusion of a discussion of one market segment only, the Federal market, in a section entitled "Technical Requirements".

We would recommend that Section VII be limited to the bid for the takeover of the Landsat D system, and that all requirements, including market requirements, if any, relevant to this bid be included in this section. In turn, Title VIII should govern the bid to provide the follow-on commercial system and, similarly, should include all requirements, including market requirements, if any, relevant to this bid. Any discussion of the Federal market that is not a requirement should be relegated to an appendix. Offerors would then be able to understand clearly what is required in order to submit a successful bid for the two major phases of the Landsat commercialization process.

In lieu of this proposal, Title VII should be reorganized into two parts; the first dealing with the Landsat D system and the second with the follow-on commercial system so that, once again, offerors can clearly understand the requirements for a successful bid. The requirements relevant to each of these parts should be included. Any discussion of the Federal market that is not a requirement should be relegated to an appendix.

CONTRACTUAL ARRANGEMENTS

1. The RFP should permit a more flexible contract approach than now appears possible. The key issue involved in the Landsat commercialization process is the successful transition from government to offeror financing and assumption of risk. It is difficult now to predict the precise moments in time at which key phases of this transition will be completed. Neither the Federal government nor the offeror should be locked into a rigid timetable for this process. Rather, an offeror should be free to propose, and the Federal government to accept, a financial basis for shifting from an initial contract mode to subsequent modes. The RFP should be broad enough to permit such a flexible contract approach.

INTERNATIONAL ARRANGEMENTS

1. The Federal government's review of the offeror's international negotiations and business relations must be spelled out more clearly. Specific guidelines and criteria must be available, so that the operator can make appropriate business decisions in preparing its bid. For example, can the Federal government refuse a system operator permission to terminate the flow of data to a foreign ground station which is refusing to pay for the data?

2. We believe that the offeror should be able to represent its interests directly at CLOS meetings, rather than being represented by the Federal government. Similarly, the operator should be able to deal directly with other foreign and international governmental entities.

OFFEROR EXPERIENCE

1. Section VIII discourages new entrepreneurs from responding to the draft RFP. It appears to be heavily weighted in favor of established large companies, particularly those with prior Federal government experience. This weighting ignores the fundamental purpose of the Landsat RFP which is to help establish a new high risk industry. U.S. industrial history is replete with successful examples of new start-up firms formed to enter high risk business arenas. Years of government contract experience may well indicate the absence, rather than the presence, of entrepreneurial skills.

We recommend that the experience of individuals and proposed sub-contractors be considered in addition to corporate experience so that start-up companies can be evaluated fairly.

2. Why are three examples of offeror's "experience in acquisition" relevant to this RFP? What does this mean?

EVALUATION CRITERIA

1. The evaluation criteria deserve further explanation. For example, is their ranking weighted? If so, does this weighting remain the same, regardless of the commercialization phase being evaluated? Are cost reductions more significant than technological advances? How much risk is the Federal government willing to take? Is the offeror's technical capability really more important than its entrepreneurial capability?

MISCELLANEOUS

1. The requirement for Federal government approval of foreign travel is burdensome and counterproductive. Offeror's worldwide marketing plans are of prime importance to the commercialization process. Offerors should be free to make appropriate judgements with respect to foreign travel.

2. Restrictions on changes in key personnel are similarly counterproductive in a commercialization process. Certainly after any initial O&M phase, the offeror should be free to operate as a business, with personnel decisions made on the basis of performance.

3. We do not believe that a FCC rulemaking is required. Why is DOC's support before the FCC being delayed until the RFP process is complete? Why cannot DOC support all potential operators before the FCC as and when they file?

4. We support the draft legislation which provides that the Federal government will continue to archive land remote sensing data, rather than the contractor as proposed in the RFP.

5. Is leasing the Landsat D system still a possible option? The "Objectives of the Solicitation" include leasing, yet Section X-A.1 is limited to the purchase of these assets, as is Section III-8, line 3.

6. The RFP does not state the amount of the contract liabilities to be assumed by the Landsat system offeror upon contract in 1985. Which contract liabilities will remain outstanding and for how much?

7. Article XLVII of Section V does not make clear what "Landsat imagery data with 'TM or MSS'"is to be delivered during the "transition period". The cross-reference to Section VII is not helpful since Section VII describes the Landsat D system but does not specify the data to be provided.

8. The cross references in Article XXI, Section V, are inaccurate.

9. Section III-5(c) requires each offeror to indicate its "relationships of foreign interest". Please clarify further.

10. An RFP release date during the holiday season is unrealistic. We recommend you defer release until January 2, 1984.

SANTA BARBARA RESEARCH CENTER
A Subsidiary of Hughes Aircraft Company
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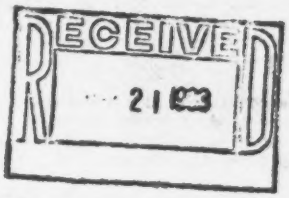
TELEPHONE: (805) 968-3511

November 18, 1983



Mr. Ray Kammer, Chairman
Source Evaluation Board for Civil Space
Remote Sensing
NBOC #1, Room 300
11420 Rockville Pike
Rockville, MD 20852

Subject: Comments on Department of Commerce Draft RFP

Dear Mr. Kammer:

Attached are SBRC's detailed comments on the 21 October 1983 Draft RFP for Transfer of Remote Sensing Satellites to the Private Sector. In addition to the specific RFP comments contained in the Attachment, we are responding to the questions contained in the RFP cover letter. Our response to your letter has been directed toward issues that are germane to the LANDSAT system; topics regarding the METSATS have not been specifically addressed. Moreover, comments regarding Appendix A are being sent under separate cover via the appropriate channels.

First, we should like to say that the RFP, as drafted, is a very good document, and we congratulate you on a super effort in a very difficult field. In particular, we believe that the document clearly shows a serious interest in promoting a viable commercial endeavor for land remote sensing satellites.

Answers to the specific questions in your letter are as follows:

1. With respect to the difference between requirements and desires, it is our preception that you have developed a relatively loose structure for LANDSAT in order to encourage innovation and competitive responses. We accept the challenge to respond with specific performance capabilities which will service your identified requirements and as many of your desires as we believe can be accommodated in the competitive environment.

2. With respect to the issue of government use of operator-owned data, we perceive no serious issues if the conventional rules of copyrighting are adhered to. In our mind, this includes recognition of the need for payment for secondary uses within the government and transmittal of copyright restrictions in any dealings between the government and third parties.

3. With respect to the issue of market diversity, we believe that the market is indeed diverse, and the model you describe is correct. There does not appear to be a need for changes to the RFP to accommodate this situation. It is up to the bidder/ private system operator to recognize this and to structure his response appropriately. All segments of the market must be serviced.

4. With respect to questions pertaining to contractual arrangements during transition and early operation, we believe that the RFP should remain quite flexible in the spirit of seeking innovative responses. It should be incumbent on the bidder to provide a recommended contracting arrangement based on his understanding of the government's needs and interests for this period. The government's acceptance of the contractor's proposed structure can, of course, be a subject for negotiation during the source-selection process. To sum up, we believe that the present relatively flexible approach should remain in the RFP.

5. With respect to the proposed contract duration of ten years, we are satisfied. Any lesser period would be insufficient, in our judgement, and a six-year span would not provide sufficient time to establish system earning potential.

6. With respect to the exercise of government oversight, we believe that the contract method is essentially sufficient for nearly all of the government's objectives. Public issues such as policing anti-competitive activities in the value-added arena can be dealt with under present anti-trust legislation or through the basic enabling legislation. We do not perceive a need for specific licensing of the enterprise.

We trust these comments will be of use and look forward to an interesting competition.

Sincerely,

Warren D. Nichols, Vice-President
SANTA BARBARA RESEARCH CENTER

WDN:bh

Attachment

SBRC

QUESTIONS AND COMMENTS REGARDING

DRAFT RFP FOR CIVIL REMOTE SENSING

i-1 Objectives of the Solicitation

The fourth paragraph states that "The government would further process and [illegible]ribute the data in certain specified ways." Would this secondary processing and distribution be exclusively within the government? What control would an outside contractor have over dissemination of information provided to the government? If control is not afforded to the contractor, and if the information is freely disseminated by the government, there will be a reduction in the return on investment to the contractor.

The copyrighted nature of LANDSAT data furnished by the commercial operator would prohibit duplication and redistribution of these data. This proscription would apply to governmental agencies, as well as private entities. Clarifying legislation may be required to define the degree of added value that would make a data product sufficiently different to permit resale.

i-2; V-22; VII.1-3 Baseline Concept, Article XLVII

It is our perception that the somewhat sketchy definition of the LANDSAT deliverables on the proposed contract is for the purpose of allowing prospective bidders wide latitude in defining their responses. It is assumed to be incumbent upon the bidder to provide a much more definitive exposition of these deliverables. Please comment on this assumption.

IV-3 Type of Contract Arrangement

This paragraph indicates that governmental assets, such as ground-processing equipment, shall remain as governmental property thoughout the transition period. Is it acceptable, within constraints established on page VIII-10, to begin transfer of selected equipments during the latter stages of the transition period?

V-22 Article XLVII LANDSAT Satellite Deliverable Items

This article indicates that TM or MSS data constitute the deliverable LANDSAT product(s) during the transition. It is assumed that the contractor shall furnish TM and MSS data as long as this is technically feasible.

VII.5-3, Para. 5.B1 Contractor Role

The second subpoint under this paragraph indicates that the contractor is to "acquire and maintain LANDSAT data archives." Shall this be interpreted to include the acquisition and management of existing LANDSAT data archives at the EROS data center, or does this apply only to data newly obtained under the commercial operator's purview? If "acquire and maintain LANDSAT data archives" only applies to newly obtained data, it is not clear whether the government intends to continue to sell the products currently archived or whether the private operator has the marketing rights to these data.

VII.5-10, Para. 2 Foreign Ground Stations

Details regarding agreements with foreign ground stations are needed. Specifically, information concerning fees, data quantities and contract duration are required.

VII.5-10, Para. 2 (continued)

Additionally, clarification is needed with regard to the disposition of fees already paid for services extending into the private operator's tenure and with regard to any constraints on future renegotiation of these fees and agreements. It is suggested that the government establish an arrangement such that the commercial operator can meet with foreign station managers, under government auspices, to effect a smooth transition.

VII.5-24 Department of the Interior

Which DOI applications require 12-hour data delivery, and is the current system capable of achieving this response?

VII.6-1, Para. 6.2 Government Role

This paragraph indicates that the government will continue R&D effort in advanced remote sensing technology. Will the successful contractor be allowed to exercise any influence over this type of development?

VII.6-7, Para. 6.5; B-4 Government R&D Instruments

It is appreciated that widespread distribution of data from R&D instruments is beneficial to all parties by verifying phenomenology and expanding the application base. However, data from governmental R&D instruments could potentially reduce sales of the commercial operators' products. What mechanism might be established to control the distribution period and scope of dissemination of competing products?

IX-4; IX-7 Financial Statements

The headings of these tables state that these are figures for COMBINED NOAA satellite programs, but it appears that these data are only for the METSATS.

Bendix

Field Engineering Corporation

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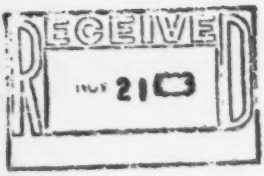
xxxxxxx 964-7000



Mr. Ray Kammer, Chairman
Source Evaluation Board for
Civil Space Remote Sensing (COM)
NBOC #1, Room 300
11420 Rockville Pike
Rockville, Maryland 20852

November 21, 1983

Dear Mr. Kammer:

Enclosed please find comments on the draft Request for Proposals for commercialization of Landsat, as requested in your October 21, 1983 cover memo. We have two overall concerns explained below, as well as a number of specific comments which are enclosed. Our comments fall in three general areas: Contractual arrangements, Commercialization concepts, and Technical issues. Our comments relate only to land remote sensing, not meteorological systems.

The first general comment relates to the draft legislation prepared by the staff of the House Science and Technology Committee. We hope the RFP and the legislation will be brought together in terms of policy and evaluation criteria. We think the draft legislation is preferable in both these areas. The second comment is that the land sensing portion of the RFP fails to separate the initial operation of the current system from the follow-on commercial system. The requirements for the former are significantly different from those for the latter, and the RFP should address each phase separately to provide potential offerors with as clear an understanding as possible of the government's expectations, preferences, and requirements for each phase.

If you would like further information on any of our comments, please feel free to contact us. We look forward to receiving the final RFP.

Sincerely,

L. R. Shaffer
Manager, Program Development

/j

Attachment

20-901 O - 84 - 79

PROPRIETARY
INFORMATION

Bendix

CONTRACTUAL ARRANGEMENTS

The cover memo (page 3) expresses a desire for a ten-year contractual arrangement beginning with a cost-type contract for the initial O&M phase, ending with an over-the-counter data purchase agreement for unspecified quantities of data. This may be desirable, but is it feasible to incorporate this concept in one contract without recompetition along the way?

We urge that the final RFP permit an offeror to establish a financial basis for moving from one contract type to another. That is essentially a "cost-minus" contract. The government pays the operation and maintenance costs, with modest incentive fees, minus the revenues from the sale of data to ground stations and other subscribers (e.g., value-added firms). At such time as the revenues exceed the costs and appear likely to continue to do so, the cost to the government, other than for direct data purchases, is zero and we have a commercial system. The critical issue for minimizing risk to the government (from the contractor failing financially), and to the offeror, is the ability to make the transition on financial rather than calendar criteria. Our comment is that we want the final RFP to be broad enough to permit this type of bid.

PROPRIETARY
INFORMATION

Bendix

CONCEPTS

Government Requirements: Throughout the RFP, reference is made to government requirements, but they are never defined. Section 5,B.3 (pp. VII, 5-23 f.f) describes general characteristics. However, many other sections require the bidder to be able to meet "government requirements" as if the bidder knows what they are, while the RFP states that "establishing firm estimates...has not been possible". What, then, will be the criteria for evaluating how well the bidder can meet these needs: One example of the dilemma is P. VII. 5-27, section 5.C.4, referring to a contractor-dedicated facility for the functions now performed at the EROS Data Center: "of interest will be the ability of such a system to fully accomplish the government requirements". What level of processing is required by the government? Does the government object to getting processed data through a value-added firm (on a competitive or exclusive basis) rather than directly from the offeror?

Archives: We believe the U. S. Government should continue to be responsible for archiving data, as proposed in the draft legislation from the Space Science and Application Subcommittee, rather than being a contractor responsibility as proposed in the RFP.

Foreign Travel/International Obligations: The foreign travel restrictions (page V-13) are totally inappropriate in light of the contractor's obligation and desire to develop the international market

for data from this system. It is in the government's interest that this market development take place as quickly as possible so the contractor achieves profitability as early as possible.

U. S. Government review of international relations (p. VII 8-12, section 8.4(a)(2)) needs better definition. If the contractor is to compete in the international marketplace, a more explicit statement (classified or otherwise) needs to be provided. Such a statement should give guidelines or criteria to be applied in the approval process (assuming the government continues to feel it necessary to approve international arrangements). For example, in export control cases, there are government guidelines available to industry, in advance of specific granting or denying of a license.

In section 8.4(a)(1)(B), page VII 8-12, we feel the system operator should have a direct role in CLOS activities, not just through a USG representative. This is particularly true during and after the transition to the next-generation commercial system.

Offeror Experience: Page VIII - 1, Experience, seems to assume certain organizational history. While it allows for joint ventures or spin-offs of existing, historied companies, it does seem weighted against new start-up companies. Individual, as well as corporate, history should be permitted, as well as sub-contractor credentials to enable an entrepreneurial enterprise to have a fair evaluation.

Bendix

Section C.4(a)(2), Key Personnel, seems overly restrictive in a 10-year contract. The offeror should be able to change or replace key personnel without government approval at least after the initial O&M phase is complete.

Evaluation Factors: Some discussion is needed of the relative importance of each phase of the proposed contract, both regarding technical and cost factors. For example, how much risk is the government willing to accept in exchange for reduced cost? Is not exceeding current costs sufficient or is there a real desire for significant reductions? Does the ranking of technical evaluation factors suggest that the follow-on plan will be given more weight than the initial O&M phase? Is this true of costs as well?

Bendix

TECHNICAL ISSUES

In order to prepare a cost estimate for operation and maintenance of the current system, specific cost data is required for services now supplied by various governmental units, as well as an explicit statement of who is responsible. Specifically:

- Communication arrangements (Page VII, 1-2, para. 1.3.e) (are these to be owned/leased, GFE?)
- TDRSS support for initial phase (P. VII, 5-5, 5-15)
- Augmentation of CSF to handle 2 Landsat-4 flight segments (whose responsibility?) (P. VII, 5.5)
- Services supplied by GSFC Networks Directorate (whose responsibility?) (P. VII, 5.5)
- Cloud cover predictions (P. VII, 5-15)
- MMF/MSS external interfaces (P. VII, 5-7)
- Communications & computation reimbursables (P. VII, 5-12)
- EROS Data Center Reimbursement (P. VII, 5-17)

Bendix

- Page VII, 5-2, 2nd para from bottom, the status of the "borrowed" equipment is not clearly defined. Is this a NOAA/NASA arrangement or is the offeror required to take some action, e.g., purchase equipment and lease to foreign ground stations?

- Page VII, 5-17, item 5A.2.C.4, this is no longer true: GSTDN-received image data is now received by DRRTS direct.

- Page VII, 5-24, some of the repeat coverage requirements specified may not be possible with a single Landsat S/C at present orbital geometry.

CONTROL DATA
0100 34th Avenue South
Mailing Address/Box O
Minneapolis, Minnesota 55440

November 18, 1983

Mr. Raymond G. Kammer, Jr.
Chairman
Source Evaluation Board of Civil
Operational Remote Sensing Satellites (COM)
NBOC #1, Room 300
11420 Rockville Pike
Rockville, MD 20852

Dear Mr. Kammer:

It is Control Data Corporation's pleasure to respond to the Draft Request for Proposal (RFP) for Transfer of United States Civil Operational Remote Sensing Satellites to the Private Sector. Control Data brings to the Source Evaluation Board (SEB) a unique perspective because we are one of only a few value-added project and services companies actively pursuing the government commercialization effort and we are a large company with the resources needed to accomplish commercialization.

Control Data suggests the balance needed in the relationship between government and the private sector during the commercialization process. The discussions that follow in the attached document are intended to provide guidelines for attaining the following RFP objectives:

- Provide an RFP which assists the SEB in making an objective and equitable evaluation of solicitations in order to select the most appropriate vendor and to avoid possible selection protests.

- Provide an RFP that allows a vendor flexibility in the type of solution they may propose and provides a conducive atmosphere for establishment of a commercial enterprise.

The two objectives may seem to be in opposition, but through our response, we hope to portray an approach that meets both objectives.

Provided for your review and use in the attachment are: an introduction section with a glossary of terms used by Control Data throughout this response, a proposed RFP structure (including a commercialization model and evaluation criteria), a response to the pre-RFP cover letter, a section with clarification requests, and a summary. Where applicable, the pre-RFP is cross-referenced.

We are available to clarify any questions you may have after reviewing our response.

Sincerely,

W. H. Bruning

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COMMERCIALIZATION OF THE CIVIL OPERATIONAL REMOTE SENSING SATELLITE SYSTEM

A
RESPONSE TO THE DRAFT RFP
BY
CONTROL DATA CORPORATION

18 NOVEMBER 1983

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5.0 SUMMARY

1.0 INTRODUCTION

1.1 Overview

Control Data realizes that modifications of the RFP involve a significant effort on the part of the U.S. Government (USG). However, Control Data is confident that the effort will expedite the evaluation and negotiation process and will lead to a successful commercialization process.

It is Control Data's understanding that only the LANDSAT portion of the draft RFP is applicable at this time. The LANDSAT requirements present a formidable challenge, but do not include any new or unproven technologies for the majority of the user requirements. The untested and high risk aspect of this endeavor is the viability of the marketplace that must support the resulting business venture. The establishment and validation of the marketplace must be an integral part of the commercialization plan and the ultimate commercial enterprise.

The success of any commercial venture is dependent on the establishment of business directions based on market requirements. The tendency in a high technology environment is often contrary to this basic business premise. The major portion of the projected markets for these data do not require significant space/sensor technological advances beyond currently projected remote sensing capabilities. The key to commercial success is the production and distribution of value-added products. In this context, the business direction must come from the commercial entity which directly services the consumer.

Control Data recommends that terms in the RFP be defined precisely and that the definitions be consistent with any pertinent legislation. Optimally, your RFP and the proposed legislation in Congress will contain the same factors and conditions in order to prevent confusion on the part of the bidders.

1.2 Glossary of Terms

The terms below are provided as a reference for use later in this text.

1.2.1 Commercialization - The transition from a USG, technology-driven program to a profitable, market-driven business.

1.2.2 Transition - The period of time between implementation of the contract until the earth remote sensing program is fully commercialized, possibly as long as twelve years. Early in the transition period the vendor could purchase and/or lease government equipment and facilities. This early period is what you have termed "transition".

1.2.3 Partnership - A multi-year appropriation commitment by the USG to enter into a contract with the private entity for the purpose of establishing a viable commercial enterprise, and to have the private entity develop a market-driven, profitable business.

1.2.4 Continuity of Data - A continuous data stream type provided for a period of time.

1.2.5 Continuity of Program - The assurance that a stable, reliable program of remote sensing will be provided.

1.2.6 ATOC - At time of contract. Transfer of ownership of the data to the contractor occurs at this point in time. (Ref. Draft RFP, Page X-2 Para. X.A.2).

1.2.7 HDDT - High Density Digital Tapes with no data calibrations or corrections applied.

1.2.8 CCT - Computer Compatible Tapes containing radiometrically and geometrically corrected digital data.

1.2.9 Value-Added Products - A hierarchy of products which should be provided by the commercial enterprise. They are: computer-compatible tapes, photographs, integrated photos, merged data sets, and decision assistance products.

1.2.10 Photograph - A scene provided in hard copy form and mapped to a standard projection.

1.2.11 Interpreted Photo - A scene which has been enhanced either manually or digitally with an overlay of a specific data set such as fault lines.

1.2.12 Merged Data Sets - A satellite scene merged with one or more types of supplemental data. The merged data set would be available in digital form for manual or digital manipulation and/or analysis.

1.2.13 Decision Assistance Product - Analyzed data sets that provide decision information. This is a product provided to the customer which he can use to influence his decision; e.g., for the operational exploration geologist a product might tell him the probability of success in drilling for oil at one or more positions.

2.0 RESPONSE TO RFP COVER LETTER

Control Data has responded directly to the following questions posed by the SEB in the cover letter of the Draft RFP.

Q. "Our hard requirements are largely based upon existing systems. To meet our other needs and desires we want innovative and competitive offers. Are the requirements and desires differentiated adequately?"

The document does not persuade us that the USG is dedicated to a successful commercialization entity which can compete both technically and financially with the attempts of other countries to enter the marketplace.

In Section 4 of this response, Control Data suggested a method for more clearly stating procurement requirements. Section 3 contains specific references to Draft RFP sections.

Q. "The new owner/operator(s) will own the data. The Government will buy it with the intent to use it in many specified ways. Are the intended Government uses specified clearly enough? What limits if any should be placed on the Government's use of the data?"

USG policy on the ownership, uses, and price structure as stated in the Draft RFP is not clear. Several topics need to be addressed prior to contractual commitment. Examples are:

- Is the USG to pay a fully competitive price for all products data received? Note, the definition of data and products are different.
- Is the USG obligated to buy a minimum volume of data?
- Will the USG be prohibited from creating or distributing value-added products which compete with those of the contractor?

Q. "We have seen the suggestion that the market for data contains a hierarchy ranging from broadly based, high volume, low value users to highly specialized, high value, low volume users. This suggests a need for different marketing arrangements for the several market sectors. The RFP is silent on this market

structure. Is there validity in the model? Should the RFP somehow make provisions for such a market structure? If so, how?"

Control Data contends raw data sales alone will not sustain sufficient revenues to make the commercial entity successful. A model for product marketing is presented in Section 4.

In addition to product development capability, bidders must have at least a nationwide marketing capability, possibly a worldwide capability, specifically targeted to the market segments which are the primary users of remotely sensed earth data. This is extremely important because the bidder must know the users' requirement and must provide product sets including hardware, software services, training, and consulting services.

Q. "Is the split between transition using Government assets and future data purchases clear? Is there a better way to accomplish the Government's objectives?"

The split is clear but it is not the best way to accomplish the task of developing a commercially viable entity while decreasing the financial support for the earth remote sensing program. The present LANDSAT system and USG facilities are neither not modern, not optimized, nor inexpensive; therefore, almost every potential bidder will plan to replace the present system, as soon as possible, with a new, cost-effective system. The RFP should spell out a twelve year, cost plus contract with incentive clauses. Less financial commitment than this by the USG will result in an unsuccessful commercialization process and an irreparable break in continuity of the US earth remote sensing program.

Q. "While we have specified our preference for a cost-type contract for the Metsats throughout the period of interest, we have not addressed the type of fee structure. Are there structures that are best for the Government or for the potential contractor(s)?

Control Data recommends a cost-plus-fixed-fee (CPFF) contract for the management and operations of the existing (LANDSAT 4/D') facilities. Previous CPFF experience indicates a 10-15 percent fee is typical.

It is further recommended that a federally chartered private entity own all subsequent LANDSAT systems. (This concept was evaluated in NOAA contract NA-83-SAC-00679 by the Earth Satellite Corporation.) The entity would market data, utilizing a decreasing government price subsidy.

Q. "Our concept for Government oversight is for a minimum involvement outside the contract itself. What is the proper role and level of involvement for the Government? How could the Government best enforce the contract provisions that surround national security and international interests? How could the Government best enforce the contract provisions regarding its data needs?"

Control Data agrees with the international and security requirements as well as the idea that the USG should have all data available for its own internal use. The USG should not provide data to any other customers. The USG and the contractor should cooperate on R&D. The USG should be the primary financial resource in the early years of the partnership. The contractor should have full discretion to establish product and marketing decisions. A management team comprised of the user community, the contractor, and the USG should oversee the program. Control, in addition to this board, should be provided under existing legislation (e.g., export licenses, etc.).

Q. "We have specified a cost type contract for the duration of the operation of the Government's LANDSAT system. But, aside from stating a preference for over-the-counter buying we have not specified a preferred contract type for the extended contract for land remote sensed data. A cost type contract does not seem suitable after the Government's system has ceased to operate. What would be some good business arrangements for the follow-on activities?"

As concluded in the final report of the Earth Satellite Corporation, Contract No. NA-83-SAC-00679, a federally chartered, privately owned corporation appears to be the best approach. As recognized by both the USG and potential bidders, a government subsidy will be required. Control Data agrees with the concept of a privately owned corporation licensed to sell raw data and value-added products.

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Q. "We have proposed a contract duration of 10 or 12 years, depending upon the system involved. Are these durations too long? Not long enough?"

Control Data recommends that only the CPFF contract for management and operation of LANDSAT 4/D' be of finite duration. Government subsidy of the private entity would be re-evaluated on a four-year review cycle for the contracted period of time.

Q. "The final RFP may ask for proposals for a two polar METSAT system, a one polar METSAT system, or both systems. This Draft RFP contains technical requirements for data and services from two polar orbiting meteorological satellites. However, two separate proposals are requested; one for a two-satellite system and one for a single-satellite system. For the single satellite system, the offeror is asked to describe what requirements can be met. Is this a reasonable way to define this dual requirement in the RFP?"

Control Data recommends that only LANDSAT systems be procured in this contract.

Control Data recommends that the response time for the final RFP be ninety (90) days rather than sixty (60) days.

3.0 CLARIFICATIONS

Control Data requests clarification concerning several paragraphs within the RFP:

- Page I-6, para. "Cost Accounting Standards" (CAS): There are 19 current CAS disclosure provisions. Would the USG consider and make exceptions from all or some of the provisions? If so, which ones?

- Page III-3, para. I.2: It makes sense, even though the OMB Circular A-76 is not applicable to this solicitation, that a total annualized comparison between cost of USG operation of LANDSAT and the contract operations be made. Will the SEB supply the present annualized cost of USG LANDSAT operations?

- Page V-11, para. - Article XXI Deliverable Items: The "In accordance with articles" should be corrected.

- Page V-19, para. - Article XXXVl Facilities to be Acquired/Fabricated: What are the criteria for approval? Shouldn't this be in the contract? If so, why is a second approval needed?

- Page V-22 & 23, para. Article XLVII: If the definition of transition period is similar to Control Data's suggestion, then "TM or MSS" should be changed to include "or other suitable substitute".

- Page VII.5-15, para. 5.A.2.C.1: In one instance you require timeliness of data (48-hr. average over 10 days) and in this paragraph you indicate the contractor will be "several places from the top". How will this priority conflict be resolved?

- Page VII.5-27, para. 5.C.4: What is the stated USG requirement for photographs? If there is not a hard requirement, why must the bidder propose a plan to produce this product?

- Page VII.5-27. para(s) 5.C.5 & 5.C.6: Incorrect section is referenced.

- Page VII.8-2, para. 8.1(b): The cost of LANDSAT data must be set by the private contractor at fair market price which will be higher than the cost of reproduction. Will the RFP clarify this?

- Page VIII-2, para. C: Does the word "environment" mean "land"?

- Page VII-8, para. C.4.2: Why are the bidders requested to provide three examples of acquisition?

- Page IX-1 through IX-26, Section IX: The financials for LANDSAT are difficult to determine or are not available. Will the RFP include the annualized costs for the total LANDSAT program 4/D'?

- Page XI-3, Section XI, Supplementary Evaluation Criteria: The three criteria listed do not appear to be necessary. Will they be eliminated?

- Page II-9: It is very clear that no funds are presently available for this RFP; moreover, it is stated that authorizing legislation is required before any award can be made. Control Data raises this point because it is atypical. Usually in government business the authorization and appropriation bills have been passed which provide the legal basis for the executive agency to undertake the procurement action. In the normal setting, each bidder knows that he is spending his proposal money recognizing that there will be "a winner". Control Data knows the SEB is aware that in this situation, the normal circumstances do not exist and this increases the risk to the point that many, if not all, potential bidders will not respond. Control Data recommends that the SEB urge rapid passage of the necessary legislation. Framework legislation is absolutely mandatory.

- Page III-3: This page contains major implications with regard to undertaking this program. It is clear that Congress may pass legislation and the Secretary of Commerce may adopt regulations which could impact the usual private sector prerogatives as they relate to operating the LANDSAT System. Moreover, it gives no assurance that the resulting contractual relationship--and its position in the marketplace--will not raise antitrust problems. Here is clearly an area where the potential recipients of the LANDSAT contract must have more details regarding the problem areas. Can there be some assurance that Congress will pass the authorizing legislation?

- Page III-6, para. entitled "Fair and Equitable Compensation to Professional Employees": The RFP contemplates a full cost breakdown of all the personnel who would be charging to the contract. As a part of that requirement, this paragraph requires the bidder to disclose the total compensation plan (salary and fringe benefits) for all employees that would be assigned to performance of the contract. Control Data would not be providing services via discrete individual assignments; therefore, this requirement seems inappropriate. Here again, this is not the usual practice that a bidder's commercially oriented service organizations encounter.

- Page III-7, para. 8 "Type of Contract Arrangement": This paragraph states the fact that during the transition period a cost plus fixed fee arrangement appears most appropriate; therefore, since the risk is minimal, the bidder should anticipate that in a site management setting, the Department of Commerce would envision a fixed fee being approximately 7% of the estimated cost, not the actual cost of performance.

- Page IV-3, para. "Type of Contract Arrangement": In this paragraph it is stated that the government "intends to buy LANDSAT data at unit prices under some form of indefinite quantity contract arrangement". This implies that there will be no assured business base since it speaks of an indefinite quantity as opposed to a "requirements" or a "definite" requirement arrangement. The balance of the paragraph indicates alternative arrangements may be proposed; however, it is clear that a cost-plus fixed fee arrangement will not be acceptable. A more specific "subsidy" arrangement is required.

  The initial phase envisioned by this solicitation is for management of USG-retained assets; in this context, the arrangement is similar to the site management contracts that NASA employs for its Cape Kennedy operations. The USG proposes a cost reimbursement type contract for this phase. With transfer of ownership, it suggests a differing contract relationship; however, this relationship is undefined. If this were a one-time, free-standing contract (calling for the furnishing of services on a cost reimbursement basis) then the risk would be minimal, putting aside the small return that the company may obtain through a

fixed fee or incentive fee arrangement. Unfortunately, this cost reimbursement arrangement is only the first step in what appears to be a heavy commitment that LANDSAT participants must make in order to be viable in succeeding phases.

- Page IV-4, para. "Certificate of Current Cost or Pricing Data": This paragraph makes it clear that the USG will require a certificate of cost or pricing data to support the estimates that would be submitted with the proposal. The proposed special and general terms and conditions that are within this RFP are what one would expect in a site management contract. In this setting, the USG is asking for full cost disclosure, the acquisition of manpower on a total cost build-up basis, and the application of stringent USG review and approval rules usually associated with cost reimbursement type contracting. These stringent cost accounting and management controls require an environment such as the many aerospace companies specializing in USG contracts can handle. Unfortunately these requirements pose large problems with commercially oriented companies. Control Data suggests this be taken into account and eliminated from the requirements of the contract.

- Page V-7, clause entitled "Harmless from Liability": This clause expects the contractor to hold the USG harmless in whole or in part for any negligence of its employees. The words "or in part" should be removed: a bidder can accept responsibility for the acts or omissions of its employees when they are totally responsible. But if the responsibility is shared with either the USG or a third party, then the bidder should not be given a hold harmless clause.

- Page V-8, para. entitled "Engineering Change Proposals": This is inappropriate for a cost-plus fixed fee type contract. The whole paragraph should be deleted.

- Page V-10 contains a paragraph entitled "Wage Determination". This contract will be subject to the "Service Contract Age" and the Secretary of Labor will mandate certain wages and fringe benefits. This provision is inappropriate to professional level people. Moreover, it may be inappropriate to the type of tasks that Control Data envisions.

- Page V-10 also contains a paragraph entitled "Change-Over". This type of paragraph is common in site management contracts, such as Cape Kennedy, where every three or four years the site management is completed and a successor contractor may win the opportunity. Control Data does not believe this provision is appropriate. There should only be one winning contractor followed by the final establishment of the private entity.

- Page V-13, provision entitled "Limitation of Government Funds": This provision anticipates that the contract awarded under this RFP would not be fully funded. This being the case, the contractor has to exert very prudent cost control in order to manage within the available dollars. The contractor's risk is therefore increased.

4.0 PROPOSED RFP STRUCTURE

Control Data has two objectives in presenting Section 4:

- It is suggested that an RFP structure which states requirements and evaluation criteria more clearly than the existing draft RFP structure. (Modelled after the Joslin Cost-Value Technique. Refer Section 4.4 for a discussion of this technique.)
- It is suggested that specification/requirement changes be made specifically for the LANDSAT commercialization. (The intent here is to indicate the nature of many of these specification changes, as it is recognized, we cannot address all items in all levels of detail.)

Following sections provide an example of how the LANDSAT commercialization contract could appear utilizing this cost-value technique. Embedded within this example are some suggested changes for the LANDSAT commercialization.

4.1 Commercialization Plan Statement of Work (SOW)

4.1.1 Overview

The objective of the SOW is to provide to the bidder three categories of information:

- A background and technical specification of the existing LANDSAT system and the commercialization plan of the future earth remote sensing satellite system.
- A list of all mandatory systems requirements which will be satisfied by the proposed earth remote sensing satellite system in order for the bidder's proposal to be judged responsive to the RFP.
- A list of all desirable earth remote sensing satellite requirements which will be cost-value evaluated by the USG for relative merit and potential implementation.

By clearly stating all LANDSAT specifications and the future earth remote sensing satellite system requirements, the USG is assured of soliciting responsive proposals which can then be objectively and equitably evaluated. At the same time,

bidders are provided a set of constraints within which they can demonstrate a flexibility in their approach.

4.1.2 SOW Specification

LANDSAT Background

(Utilize Section VII-5 (A) of the RFP. This includes pages VII-5.1 through VII-5.22.)

Commercialization Plan Specification

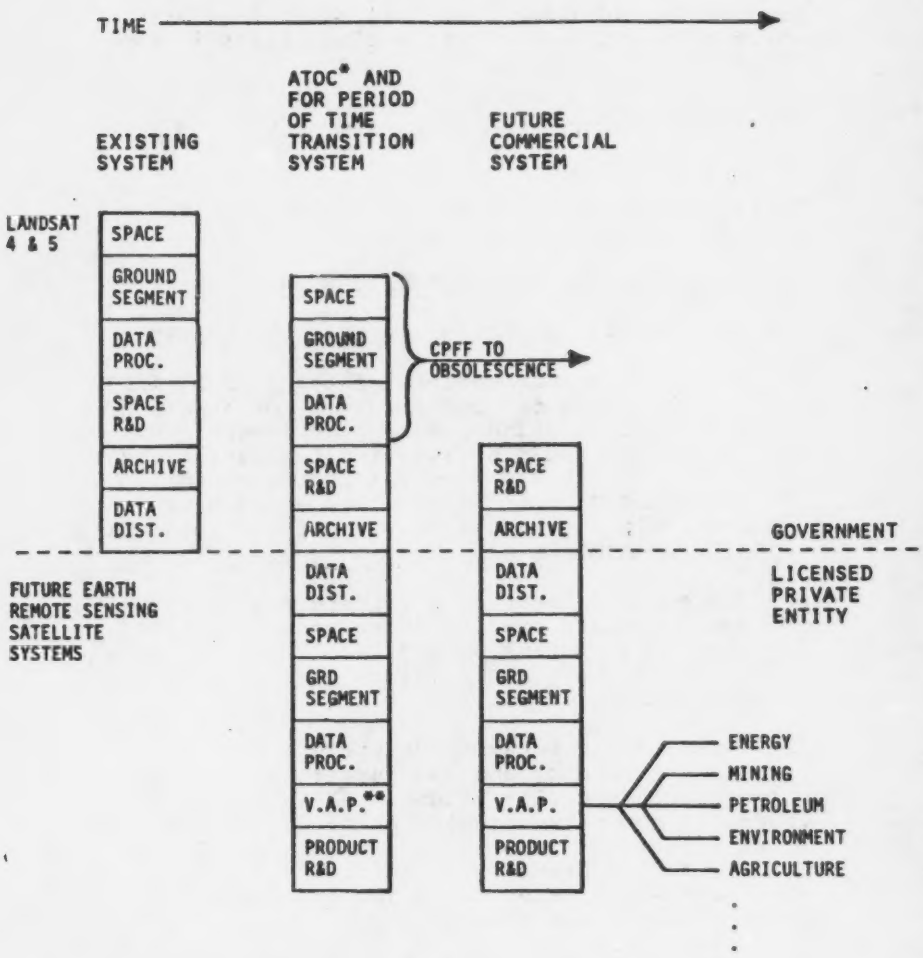
The USG has two intentions in this procurement:

- o A status quo maintenance of the LANDSAT 4/D' systems, with the USG retaining ownership of the facilities and possibly equipment. The contractor would operate the facilities under a Cost Plus Fixed Fee type contract until LANDSAT 4/D' obsolescence and would have ownership rights and privileges for the data systems ATOC to perpetuity.

- o The establishment of a private entity which would own and operate earth remote sensing satellite systems beyond LANDSAT 4/D'. This is the primary and ultimate goal of this procurement.

The relationship between the present system, the transition systems, and the commercialized enterprise is conceptually illustrated in Figure 4.1 (page 15) and discussed in detail in the remainder of this section. The existing segments of the LANDSAT 4/D' systems shown in Figure 4.1 (page 15) are those which were identified and discussed in LANDSAT background section.

At time of contract (ATOC, Figure 4.1), the contractor would assume operational responsibility for the space, ground, and data processing segments of LANDSAT 4/D' until effective obsolescence. Archive and R&D segments would remain the responsibility of the USG; note, this is contrary to the draft RFP's intent. Also at the time of contract, the contractor will establish a private entity which will assume ownership of all LANDSAT 4/D' MSS and TM data and will assume all data distribution functions from the USG.



*ATOC--At time of contract
**V.A.P.--Value-added products

Figure 4.1 LANDSAT Sequence Configuration for Government and Contractor Over-time

This private entity will initiate the development and implementation of subsequent earth remote sensing satellite systems. As the USG requires continuity of land remote sensing satellite data, the USG will provide financial resources for the development and implementation of the subsequent earth remote sensing satellite system(s) until the private entity has established a profitable, operational earth remote sensing satellite system or until the contract comes to an end.

Because of the USG's requirements for data and because the USG's objective is to ensure a viable commercial entity at the end of the transition period, it is necessary for the USG to become a financial partner during the transition. A mutually agreed upon termination clause is mandatory. An impartial oversight committee should be set up with members from USG and the private remote sensing user community. The committee will review the activities of the commercial enterprise and will determine if the selected contractor is carrying out the intent of the contract. It is anticipated that present legislation and regulations will suffice to enforce the contract requirements.

(Other information pertaining to LANDSAT from Sections VII-5.B to VII-6 should be added to demonstrate the USG specifications and intent in transfer of LANDSAT to a private entity).

The price to be charged for LANDSAT data and the future earth remote sensing satellite system would be that deemed competitive by the private entity. Lower prices for USG preferred customers could be effected by USG subsidy of the standard price to that customer. Included could be universities and Third World countries.

It is assumed that the sale of raw earth remote sensing satellite systems data alone will not result in a profitable private entity. Rather, the sale of earth remote sensing satellite system data enhanced for utilization by distinct market segments will result in a diversified product set ranging from the high volume and low value of raw data to the low volume and high value of "value-added" data products. Figure 4.2 (page 17) illustrates the product set scenario a contractor may implement to match market requirements.

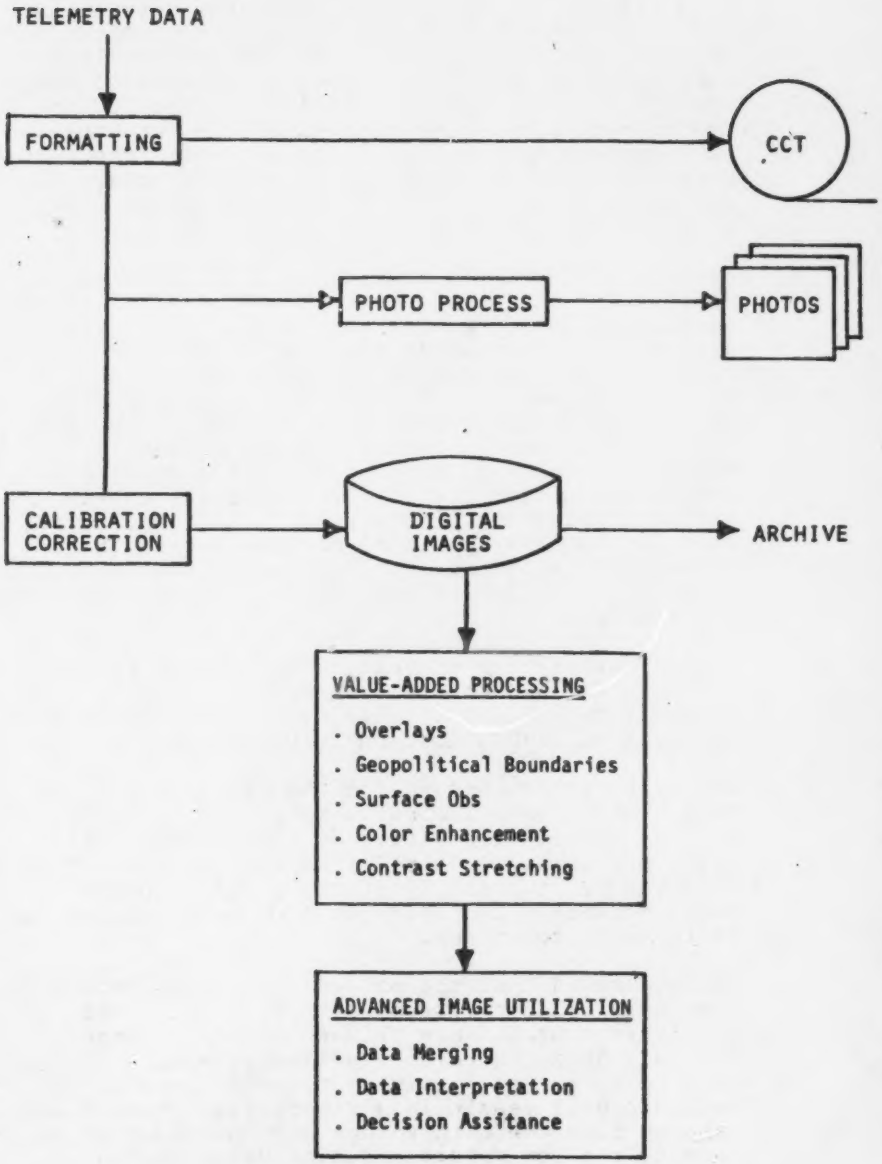


Figure 4.2 LANDSAT Data Product Development

Value-added data products will be industry specific; e.g., government, engineering, construction, energy, mining, agriculture, and petroleum. Data sets relevant to each industry may be collected by the contractor and may be utilized to produce the value-added products marketable to each industry segment.

To date, one of the most significant problems in the utilization of remote sensing data has been that of education. The engineering and physical science (geology, hydrology, mining, agricultural, etc.) skills required to manipulate and utilize remote sensing data must be consolidated within USG agencies, university departments, professional societies, and industry. Where this capability is fragmented, transfer of value-added product development has been lacking. The primary market requirement is not raw satellite data which most users cannot utilize. Rather, the provision of engineered, secondary products at a competitive price will create an international marketplace for remotely sensed product sets which will support profitable, private industry. Also, the successful marketing of raw data and value-added products will require the development of future satellite systems and sensors having higher spatial, spectral, and temporal resolution.

4.2 Mandatory Requirements

The purpose of this section is to delineate a set of requirements which must be specifically addressed in all proposals. By including discussion of these subjects, the bidder will give the USG a basis on which to judge the bidder's ability to perform the program's mandatory aspects. Failure to satisfactorily address any of these points could cause the entire porposal to be deemed non-responsive.

This section is divided into three parts: national security, technical, and commercial issues.

4.2.1. National Security and International Considerations (Refer to Draft RFP Sections VII.8)

Basic requirements: The contractor and each subcontractor must qualify as a "U.S. firm". The contractor must adhere to the requirements of Appendix A on National Security. The contractor must abide by the "open skies" policy of the RFP.

Within the framework of these basic requirements, the proposal will include discussion of the following points:

- How will the bidder meet the requirements of Appendix A of the RFP?
- How does the bidder plan to provide accessibility to data by foreign users?

4.2.2 Technical

Basic requirements: The contractor must continue to operate the present LANDSAT systems until they fail or are replaced. The contractor must launch and operate post-LANDSAT D' sensors so as to provide continuity of the program through the life of the contract. The contractor must provide, as a minimum, 50 TM and 200 MSS scenes per day, in a 48-hour turnaround time period, averaged over 10 days while LANDSAT 4/D' are operational.

Within the framework of these basic requirements, the proposal will include discussion of the following points:

- How will the bidder provide spacecraft preparation, launch, and command and control? What facilities will be used?
- How will the bidder provide data processing functions? What facilities, equipment, and personnel will be used?
- What is the bidder's general plan for research and development toward advanced sensors? What is the bidder's plan regarding launch and command and control of new satellites? (Refer to Draft RFP Sections VII.6, VII6.5.C.8, VII.6.5, VII.6.6).

4.2.3 Commercialization

Basic requirements: The bidder will develop a viable commercial enterprise which will be self-supporting by the end of the contract period. (Refer to Draft RFP Section VIII).

Within the framework of this basic requirement, the proposal will include discussion of the following points:

- What is the bidder's plan for developing a viable business enterprise? What is the role of the USG in this plan?
- What types of value-added products will be marketed? How will this market be developed? How will the types/quantities/timeliness of data products meet USG and other user's needs?
- How will the bidder distribute the data and value-added products?
- What is the planned approach regarding the price of data products?
- How will the plan accommodate the required relationship with foreign users, both with regard to price and availability of data?

4.3 Desirable Requirements

The previous section described mandatory requirements which a bidder must satisfy to be minimally responsive to the LANDSAT solicitation. The purpose of this section is to indicate features and capabilities which are desirable to the USG; i.e., have value to the USG but may be satisfied to different degrees by different bidders. Following are five examples of desirable requirements.

4.3.1 Scenes Per Day

A mandatory minimum production rate (scenes/day) was specified in Section 4.2.2. The bidder may increase processing capability to produce additional number of scenes/day for a proportional value as shown in Figure 4.3.

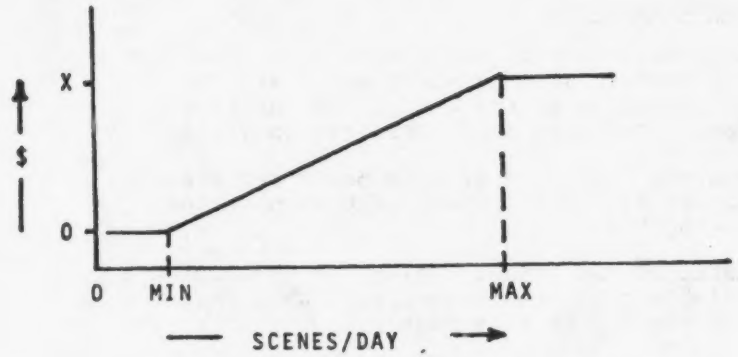


Figure 4.3 Value of Scene Production

4.3.2 Archive of LANDSAT Data

The USG desires the private entity assume responsibility for data archive. The bidder may propose assuming archive functions and receive a value rating equivalent to the estimated annual cost of archive operation.

4.3.3 Corporate Experience (Analogous to Sec. VIII of the Draft RFP)

The USG wishes to have a high degree of confidence in the bidder in the areas of USG contracting, space segment development, remote sensing, data processing, and product marketing as established by historical record. Although it is difficult to assign a value to such information, it is desirable that each bidder establish his capability in each of these areas, indicating number of years of experience in each. The USG reserves the right to request explicit verification of data at any later date.

4.3.4 Research and Development of New Technology

Industry standard indicates corporations spend about 5% of revenue on new product research and development. The USG desires that the U.S. stay in the lead in land remote sensing. To that end, as stated in the mandatory requirements, the USG requires a minimum percent of gross revenue be invested in R&D. Additional value will be applied for a proposed higher R&D percentage.

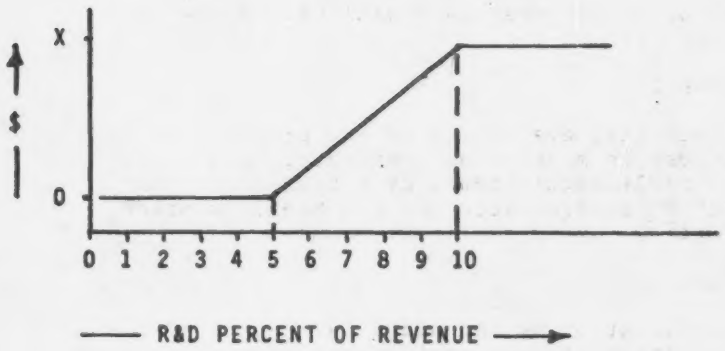


Figure 4.4 Value of Percent of Revenue Used for R&D

4.3.5 Commercialization Marketing Plan

It is the view of the USG that the primary marketplace is in value-added products. The development of these products and this marketplace are of real value to the USG because:

- It is in the best interest of the USG to stimulate the development of a privately owned LANDSAT enterprise of long term viability to provide program continuity.
- Greater revenues and profitability for the LANDSAT enterprise can be translated directly into a more rapid decrease in necessary USG subsidy.

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Therefore, the USG desires that bidders in their proposals provide a LANDSAT product development and market plan, including anticipated revenue and profit.

4.4 Evaluation Methodology

The next two sections discuss the phases within the suggested evaluation methodology and the methods of comparing the bidders' proposals.

4.4.1 Phases of Evaluation

Evaluation of RFP responses will take place in three phases:

- PHASE I

  A technical evaluation of the proposal's success in meeting both mandatory and desirable requirements by a technical team with NO consideration of the bidder's price offering.

- PHASE II

  Participation by technical team members in an evaluation of past performance of bidders to confirm the ability of said bidders to fulfill the stated requirements.

- PHASE III

  Application of pricing information against the result of the technical evaluation, resulting from Phases I and II above, to determine the most cost-effective proposal.

4.4.2 Method of Comparison

Cost comparison in current dollars will be used in the selection process as follows:

- Final selection will be based on the proposal which meets all mandatory requirements and which has the lowest "x-year effective cost".

- Effective cost is the "real cost" minus the "desirable benefits".

- Real cost is the bid price for each of the x-years including hardware, software, maintenance, transportation, marketing expense, etc., of the complete system which meets mandatory requirements plus the cost of any necessary upgrades or replacement of components to meet future requirements. This latter cost will be calculated as the incremental difference in cost between the then current USG operating costs and the costs defined by bidders for the x-years.

- Desirable benefits will be calculated for each item included in the desirables section. The dollar value indicated with each item represents a maximum annual value to the USG for each item. Should the feature not be present on a proposed configuration, no amount would be subtracted in calculating the effective cost. Should the feature be provided at no cost to the USG, the maximum annual value will be subtracted in calculating effective costs. Should the feature be available at a cost to the USG, up to the maximum annual value indicated in this specification, the desirable benefit for that feature will be determined by subtracting its cost from its assigned value; the resultant difference will be subtracted in calculating effective cost. If the cost is greater than the maximum value, no deduction will be made.

During Phase I of the proposal evaluation, the technical team will confirm that each mandatory item listed can be met in each of the x-years. Any proposal deemed unable to comply with mandatories may be eliminated from further consideration.

5.0 SUMMARY

In this response to the SEB's Draft RFP, Control Data has tried to clearly state its position on the proposed commercialization of the earth-remote-sensing program. The main points have been:

- The establishment of a fully self-supporting commercial endeavor will take more than the two years until the obsolescence of LANDSAT 4/D'. Hardware and software must be optimized and markets must be developed. The USG must be prepared to play a financial role during the 10- to 12-year commercialization.

- The RFP in its final form should contain evaluation criteria, a list of mandatory requirements, and a list of desirables. This will enable bidders to know the rules by which their proposals will be evaluated.

- The key to developing a successful business enterprise lies in value-added products, such as merged data sets or decision assistance products and services. The RFP in its final form should require that the bidder discuss his product and marketing plans for present products as well as future value-added products. The commercialization contractor must be allowed to participate in the value-added marketplace.

- A successful bidder must be able to make responsible technical and business decisions without the intimate involvement of government agencies. It is our hope that the final RFP will reflect this attitude.

e1286B-9

RCA|Government Systems Division|Astro-Electronics
P.O. Box 800|Princeton, New Jersey 08540|Telephone (609) 426-3400

Source Evaluation Board for Civil
Remote Sensing (COM)
NBOC #1, Room 300
11420 Rockville Pike
Rockville, Maryland 20852

RCA

November 15, 1983

Gentlemen:

RCA Astro-Electronics has reviewed the draft RFP for the commercialization of the Civil Operational Remote Sensing satellites and is pleased to have an opportunity to comment on what we believe to be the appropriate issues. As you are aware, we have been involved with low altitude operational remote sensing spacecraft since the inception of the concept and plan to maintain our leading role in this area, so we are very much affected by this topic.

We have reviewed the document in some detail, however, the evolution of events, of which we are all aware during the last month, has been such that a detailed technical response at this time, especially in the case of the METSAT's, would serve no purpose. We do feel, however, that there are several broad issues which are of significant importance to future operational earth observation satellites and therefore require comment.

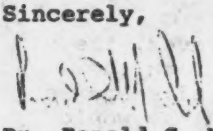
Our position on this issue was recently stated by Mr. Charles A. Schmidt, Division Vice President and General Manager of RCA Astro-Electronics, in his testimony before the combined Natural Resources, Agriculture Research and Environment and Space Science and Applications Subcommittees of the House of Representatives on the Scheuer/Volkmer Bill concerning land remote sensing. A copy of that testimony is attached for your information. The major thrust of the testimony, with regard to the RFP, is that we believe the SEB should remain in place, modify the RFP to be consistent with the provisions of the emerging legislation and issue the RFP for the follow-on earth observation satellite system as soon as possible. We believe that this would not only be an extremely efficient manner for the government to proceed, but is also the only

realistic mechanism whereby the continuity of data after the demise of Landsat D[1] could be assured. Further, our reading of the draft RFP and the draft legislation indicates to us that the proposed RFP modfication is feasible without abandening the SEB effort and starting over; albeit we appreciate that at present there are substantial philosophical approaches between the RFP and the draft Bill. It is our opinion that these philosophical differences could be resolved in the RFP and result in a framework consistent with the ability to continue and expand the United States land observation program while moving it into the private sector in a manner feasible and equitable to all interested parties.

Our position on most of the specific questions raised in the cover letter to the draft RFP distribution (dated October 21, 1983) are covered in the attached testimony and will not be reiterated here. We do, however, have several specific comments and questions on the RFP as currently written, please find these attached as a separate list, these may or may not be germane to a revised RFP for a land-only system (under the assumption that the METSATS are removed from your purview).

Thank you for this opportunity to express our views on this timely subject and we look forward to an RFP release for the commercial, next-generation land remote sensing system.

Sincerely,



Dr. Ronald C. Maehl
Manager, Market Development - NASA

RCA COMMENTS ON THE DRAFT RFP FOR CIVIL OPERATIONAL REMOTE SENSING SATELLITES

1. The request to define a single polar meteorological satellite system should be deleted. In our opinion it has been sufficiently well demonstrated that a single polar orbiter system poses grave risks to the public safety and Congress has repeatedly reconfirmed this to be a risk the country should not take. It is our position that premature failure on orbit or failure to achieve orbit, could result in significant outages that would pose grave dangers to the public, not to mention the severe decay in our ability to predict weather patterns over three to five days and the associated economic benefits.

2. On Page III-2 the Framework for Government Oversight is provided -- where does NASA fit into this relative to their R&D role?

3. In view of the critical nature of a continuous flow of METSAT data, is the government willing to establish a launch priority for these systems -- either ELV's or STS? If so, what is that priority relative to other government or commercial activities (specifically, the next generation earth remote sensing system)?

4. On Page VII, 3-22 (Par. 3.C.8) "Coordination methods to mainta and foster system continuity with the DoD meteorological satellite system" was called for. What specific continuity is to be address

5. On the earth remote sensing system follow-on after Landsat D^1, does the SEB have any specific view on which instrument, the MSS or TM, should be considered the primary data source?

6. With regard to the foreign LANDSAT stations, when does the government's (NOAA's) agreements come up for renegotiation as to yearly fee and royalties?

7. What are the charges to a commercial user of TDRSS? Can these be expected to remain fixed for some guaranteed pricing period? If so, what period and at what rate? The same question applies to other government facilities we may require, such as those used for tracking and ephimeris determination. Will government facilities be made available, at government rates, for these functions? In addition, it is important to know the availability of TDRS on a day-to-day basis to support this mission. This issue is equally important as cost and should be addressed in detail (including availability when the SS[illegible] is in-orbit).

8. On Page VII, 6-2 (Par. 6.2) you indicate the need for the commercial spacecraft to be able to accommodate research instruments. Are these instruments to be GFE and is each subject to negotiation as to cost reimbursement to the commercial company?

9. Does the SEB interpret the non-discriminatory data access policy to allow the exclusive collection and sale of data to a specific customer without placing the data in a public archive?

10. The Marketing Plan called out on Page VIII-4 through VIII-6 would be very sensitive proprietary data. Will it be protected from any disclosure through the Freedom of Information Act or other dissemination to non-government sources?

11. GFE provided launch would significantly reduce the cost of the overall system; it would eliminate loading on the launch cost. This being the case, why doesn't the government give serious consideration to GFE launch as part of the subsidy to the system? If it is not possible to have the launch facilities be GFE, then they should be made available at government rates rather than commercial rates.

12. Would launch on a foreign booster be considered a violation of the U.S. company provision?

13. Will the commercial entity be given first right of refusal for new systems the government may initiate, such as Ocean Satellite or Wind Satellite?

14. The renewal option will depend on anticipated launch schedules and spacecraft life and may therefore vary among offerers. Offerers should be required to state when the option needs to be exercised and should be given some flexibility in terms of both contractual periods and option periods. This is especially important to the government's ability to evaluate the true system cost given the uncertainties in the values of residual assets. We therefore suggest that a minimum and maximum contractual period be specified but that the offer be free to determine the specific period within these constraints.

15. In Section VII 5-15, the land data rate is given as 4X10" bits/day, this is roughly three times the data rate given in Section VII 5-2. Our calculations indicate that Section VII 5-2 is closer to the current rate. Please clarify this issue.

GENERAL ELECTRIC
COMPANY
SPACE SYSTEMS DIVISION
VALLEY FORGE SPACE CENTER
P.O. BOX 8555 PHILADELPHIA, PA. 19101

November 4, 1983

A. J. ROSENBERG
VICE PRESIDENT AND
GENERAL MANAGER

Source Evaluation Board
for Civil Space Remote Sensing
NBOC #1, Room 300
11420 Rockville Pike
Rockville, MD 20852

Attention: Mr. R. Kammer

Reference: Draft Request for Proposals (RFP) for
Transfer of United States Civil Operational
Remote Sensing Satellites to the Private Sector
Dated October 21, 1983

Dear Mr. Kammer:

Thank you for the opportunity to review and comment on the draft RFP. In our review, we did not seriously consider weather satellites because we anticipate that current Congressional action will result in weather satellites being precluded from transfer to the private sector and the commercialization process. We did concentrate our attention on the land sensing satellites based on our considerable experience and interest in that area. In our judgement, the RFP does not provide a positive situation that is attractive for private sector investment and involvement in land remote sensing. Specifically, the General Electric Company does not plan to respond to this solicitation.

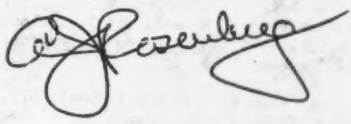
The RFP requires the private sector to assume full responsibility for all aspects of land remote sensing, including commitment to future satellites before any level of market development has been accomplished. Further, the government requires this initiative without providing any positive indication of support, either financial or contractual. Today, the federal government purchases approximately 75% of all Landsat data currently sold, yet it foresees itself having a smaller share of the future market and is unwilling to commit to any level of data purchase beyond an indefinite quantity contract arrangement. The dollar volume of all current and projected sales is miniscule relative to the investment required for follow-on satellites and the cost of data operations. At the same time, the government expects a rather detailed, compliant proposal which will be very expensive to generate, without providing a clear understanding of what is acceptable to the government and the real evaluation criteria which will be used.

General Electric has testified and commented on several occasions that this is not the right time to consider commercialization of the land remote sensing system. Landsat is just entering its operational phase, foreign competition is coming on line in the near term, users are not sure of the future of the Landsat program, and the market for remote sensing products and services has not been systematically developed. Under these conditions, we seriously question whether any private sector venture could be viable. On the other hand, if the government must provide a major subsidy or give away its assets to promote such a venture, that does not constitute commercialization in our view.

To us it appears that only the government can guarantee data continuity and an on-going land remote sensing system, which we believe is a proper role for government.

I trust that my comments will be helpful.

Very truly yours,



SDSU

SOUTH DAKOTA STATE UNIVERSITY
Box 2170
Brookings, SD 57007-0392

cc. Jack Wilkie
Dave Cwl 4/50

Department of Animal and Range Sciences
Livestock—Poultry—Meat Science—
Range Science
College of Agriculture and Biological
Sciences
Phone: (605) 688-5185

November 18, 1983

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Source Evaluation Board for Civil Space Remote Sensing (COR)
NBOC #1, Room 300
11420 Rockville Pike
Rockville, MD 20852

This letter is in regard to the "Draft Request for Proposals for Transfer of United States Civil Operational Remote Sensing Satellites to the Private Sector." I am an educator and research scientist involved in the use of remote sensing in the management of renewable natural resources, with special concern for the range ecosystems of the world. My views and concerns on commercialization have been presented very ably by Dr. Thomas M. Lillesand in testimony before the Subcommittee on Space Science and Applications and the Subcommittee on Natural Resources, Agricultural Research and Environment of the House Committee on Science and Technology on 21 July, 1983 and subsequently published in Photogrammatic Engineering and Remote Sensing 49:1461-1467 (October 1983).

Many of my concerns were dealt with satisfactorily in one place or another in the RFP. However, I am still concerned that products will be priced too high to develop a market for space imagery products in natural resource management. The use of remote sensing in natural resource management has very great potential, but is still in a research mode. I would like to reiterate the recommendation the Society of Photogrammetry that "--- prices for Landsat data reflect the actual cost of reproduction and dissemination." If actual costs are charged before methods and procedures for using Landsat data in natural resource management have been developed and accepted by the managers it is probable that these data products will not be used.

My concern regarding the need for future research and development to maintain technological leadership in the world seem to be addressed in the proposal.

Sincerely yours,

James K. Lewis

James K. Lewis
Professor of Animal and Range Sciences

American Society of Photogrammetry

210 Little Falls Street, Falls Church, Virginia 22046
Telephone: (703) 534-6617

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COMMITTEE ON SCIENCE AND TECHNOLOGY

November 14, 1983

The President
The White House
Washington, D.C. 20500

Dear Mr. President:

The American Society of Photogrammetry (ASP) is an international scientific organization with 8,000 members in photogrammetry and remote sensing. During the past decade, the ASP has carefully watched the application of remote sensing from space. This development has been exemplified by the successful launch and operation of a generation of Land remote sensing satellites (Landsat), which we consider to be a brilliant success.

We are now concerned by the apparent demise of the Landsat program and the absence of a specific policy and program to convert Landsat into an operational system.

In testimony before the House Committee on Science and Technology, we endorsed the goal of commercialization of such satellites, but suggested that the sale be phased in and coupled with continued research and development of this technology.

The attached resolution, unanimously approved by our Board of Direction on September 22, 1983, sets forth our concerns and recommendation on this matter. We believe the action we recommend deserves the consideration of your Administration.

Sincerely,

William G. Hemple

William G. Hemple
President, ASP

WGH/js

cc: Director, Office of Management and Budget
Secretary of Commerce
Chairman, House Committee on Science and Technology
Chairman, Senate Committee on Commerce, Science and Transportation
Director, Office of Science and Technology Policy

LAND REMOTE SENSING SATELLITE ADVISORY COMMITTEE
JULY 29, 1983

RECOMMENDATIONS

1. We endorse the earliest possible launch of Landsat D' and strongly recommend the immediate commitment to Landsat D' in a configuration which will ensure the continuity of TM-quality data. This statement is set in the context of the premature failure of Landsat 4, the unpredictable lifetime of Landsat D', and the pending dependency of U.S. private and Government users on foreign systems in the late 1980's.
2. The Committee strongly recommends that the Government ensure the continuity of long-term research and development in the gathering and applications of Land, Ocean and Atmospheric Remote Sensing. Such continuity may include governmental, industrial and academically sponsored R&D either separately or in combination.
3. The Committee recommends that the governmental review and regulation of commercial remote sensing sensors, data and applications, either nationally or internationally, be limited to matters clearly in the national interest and not inhibit commercial competition in the world market place.

Endorsed by the American Society of Photogrammetry Board of Direction September 22, 1983.

AMERICAN SOCIETY OF PHOTOGRAMMETRY
RESOLUTION ON
THE CONTINUATION OF THE EARTH SENSING PROGRAM

Whereas the American Society of Photogrammetry is aware of the substantial short and long-term benefits to both the public and private sector resulting from the sensing of the Earth from space;

Whereas this Society has continuously supported the Earth sensing (Landsat) program and underscored the need for its conversion from an experimental to an operational system;

Whereas the Landsat program now has an expected life of no more than two or three years with no replacement or continuation defined;

Whereas the ongoing efforts to commercialize the Landsat system have raised serious question about the advisability of total system transfer to the private sector at this time;

Whereas it takes a minimum of four to five years to design and launch an operational Earth sensing spacecraft;

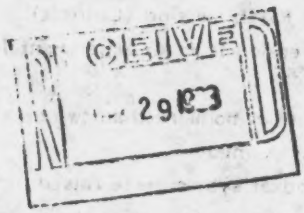
Whereas this Society is aware of other governments defining and building Earth sensing satellites for operational use based largely on U.S. developed technology;

Whereas the United States risks losing its world leadership in Earth remote sensing technology and application;

Now therefore be it resolved that the American Society of Photogrammetry petitions the Government of the United States to take immediate action to continue government support of an operational Earth satellite system which provides for staged private sector ownership and operation only at such time, and in such fashion, as to insure the system's greatest service to the national interest.

Approved by the American Society of Photogrammetry Board of Direction September 22, 1983.

NATIONAL COUNCIL OF INDUSTRIAL METEOROLOGISTS



Please reply to:
METEOROLOGICAL STANDARDS INSTITUTE
841 Seventh Lane,
Fox Island, WA 98333
(206) 549 - 2179

November 12, 1983

Malcolm Baldridge
Secretary of Commerce
Herbert C. Hoover Building
14th and Constitution Avenue
Washington, D. C. 20230

Dear Mr. Secretary:

The National Council of Industrial Meteorologists has carefully considered the proposed sale of the nation's meteorological satellites. This letter is to communicate to you some concerns of the private meteorological community and to make suggestions that we hope you will find useful in considering this important matter.

NCIM members comprise the largest private group of users of meteorological data in the United States. We distribute data and refined products to the media, industrial and commercial customers. Our products reach most of the American public and many international users. We believe that the public is best served by an atmosphere of competition and innovation by those who would provide products and services.

A monopoly suppresses innovation and decreases the benefits the public has a right to expect. If there is to be a monopoly in the supply of meteorological satellite products, the NCIM believes it should be a government monopoly, so that each of us has an equal opportunity to influence its policies through normal political contacts.

The NCIM suggests that the competition and innovation can be stimulated by authorizing two companies to launch and manage meteorological satellites. One company can be authorized to launch the first new satellite. The companies can then take turns launching future satellites. Each should be encouraged to

do research and to implement improvements on its satellites. However, the rules should state that the same innovations should be available for any subsequent satellites. The advantage of being first with an improved product should offer sufficient incentive for innovation. The pressures of competition between two suppliers for distribution of products should keep prices reasonable with courteous and flexible services.

The main concern of the NCIM is that competition and innovation be the key features in any transfer of our meteorological satellites to private ownership and operation. The public interest cannot be well served otherwise. We would welcome an opportunity to expand on the above suggestion and other possible mechanisms that we believe are in the public interest. Please let us know if we can help.

Sincerely yours,

Thomas J. Lockhart
President

NASA
National Aeronautics and
Space Administration
Washington, D.C
20546

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DEC - 5

Reply to Attn of F

November 30, 1983

Mr. Anthony J. Calio
Chairman
Interagency Board on Civil Operational
Earth-Observing Satellite Systems
Department of Commerce
National Oceanic and Atmospheric Administration
Washington, DC 20230

Dear Tony:

As requested in your November 21 memorandum to the IB-COESS members, we at NASA have examined the question of the U.S. Government's transferring the Landsat System to the private sector in light of the decision to continue operating the Metsat System as a government function.

Assuring continuity of the Landsat System is clearly in the U.S. national interest and NASA would support the transfer of the system to a private operator under the conditions the IB-COESS has already discussed in order that Landsat remain in operation. As we have noted previously, there are two conditions which NASA considers vital in any transfer. First, U.S. Government R&D requirements must be satisfied by any private operator. Second, the U.S. Government should require that the policy of "non-discriminatory access" be observed by the private operator. Our reasons for insisting on these conditions have already been outlined in detail within the IB-COESS framework and these remain valid.

If, for some reason, an acceptable transfer cannot be arranged, we think the future of land observing satellite operations should be re-examined with a view toward keeping the system in operation under U.S. Government ownership.

I hope that the above will be helpful to you and to Secretary Baldrige in your efforts to affect the transfer of Landsat. Please do not hesitate to let me know if you need additional views or information from NASA on this issue.

Sincerely,

Norman Terrell
Associate Administrator
for Policy

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

DEC 9 1983

Mr. Ray Kammer, Chairman
Source Evaluation Board for Civil Space
Remote Sensing (COM)
11420 Rockville Pike
Rockville, Maryland 20852

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DEC 14 1983

Dear Mr. Kammer:

The Department of the Interior is taking this opportunity to comment on the draft Request for Proposal (RFP) for Transfer of U.S. Civil Operational Remote Sensing Satellites to the Private Sector. Recognizing the short time available for preparation of the RFP and the significant amount of work involved, the Source Evaluation Board (SEB) is to be commended for its effort. However, there are still a few issues which we believe should be addressed before the RFP is officially released.

An important concern to us is that the RFP does not require potential operators to make Landsat data available to all users on a nondiscriminatory basis. The current U.S. policy of nondiscriminatory and open dissemination of remotely sensed satellite data has served our country well in the past and has been a model for other countries of the free world to follow. It has been a key element of our space policy, espoused in the United Nations for over a decade. Further comments on this issue are presented in the enclosure.

The enclosure provides additional comments and suggestions regarding these issues and other aspects of the RFP, most of which are specific to Landsat. We hope these comments are useful in revising the RFP for release for private industry consideration. Please contact our representatives on the SEB for additional information.

Sincerely,

William P. Pendley
Deputy Assistant Secretary
for Energy and Minerals

Enclosure

DEPARTMENT OF THE INTERIOR COMMENTS
ON THE DRAFT REQUEST FOR PROPOSALS FOR
TRANSFER OF THE U.S. CIVIL OPERATIONAL REMOTE SENSING
SATELLITES TO THE PRIVATE SECTOR

The following comments are referenced to specific page(s) of the draft RFP where appropriate.

1. Nondiscriminatory Data Dissemination

A. The RFP does not firmly require potential operators to make Landsat data available to all users on a nondiscriminatory basis. However, the RFP is quite clear that Metsat "data will be made available to all customers on a nondiscriminatory basis" (page VII.8-9). The lack of a clearly and explicitly worded parallel requirement for Landsat data is a serious shortcoming of the RFP. The current U.S. policy of nondiscriminatory and open dissemination of remotely sensed satellite data has served our country well in the past and has been a model for other countries of the free world to follow. It has been a key element of our space policy, espoused in the United Nations and other fora for more than a decade. This policy has helped to facilitate the open exchange of technical and scientific data between the United States (through agencies such as NASA and the U.S. Geological Survey, for example) and foreign

countries. Attempts to alter this long-standing policy may impact the degree to which other countries may wish to share their scientific data with the United States.

B. A related concern is the manner in which the RFP permits the operator to institute changes in existing policies, such as data dissemination and agreements with foreign ground stations. As stated on page III-2, questions regarding international commitments and national security obligations will be handled through the Department of Commerce contracting officer, with decisions "made by the appropriate agency or department." This arrangement would permit changes in data acquisition and distribution policy to be made without the appropriate interagency discussion and attention that such changes would merit. We suggest that such proposals be considered by an interagency board or other group that would provide an open forum for consideration of any changes that the operator proposes.

C. Discussion of SPOT data distribution policies (page VII.8-2) takes the most negative view. There is no particular evidence at this time suggesting that the French will deviate from their stated policy of open data dissemination.

D. Although the U.S. Government is prepared to grant the operator exclusive ownership of all data (page VII.8-13), enforcement of copyright would be difficult.

Simple manipulations of the data could be made by a user, permitting the "value-added" product to be freely distributed. Bidders will probably recognize that copyright priviledges would in reality have limited value. The SEB may wish to reflect this probability in the RFP.

2. Landsat Archives

The RFP states in the Contractor Role section (page VII.5-23) that the operator will acquire and maintain the existing Landsat data archives. However, the Landsat Data Archives section (page VII.5-26) begins with "Proposals addressing takeover of the existing Landsat data archives ...." which suggests that there may be some option open to the bidder. Interior believes that historical Landsat data are valuable for comparing changes and monitoring surface disturbances, and that permanent archives should be maintained. Therefore, Interior supports specific RFP language that requires the operator to take over the existing archive, as well as to archive new data that the operator collects.

3. Government Data Needs

A. Requirements in this section (pages VII.5-23 to VII.5-26) are vague (DOI, DOA), absent (AID), or noncommittal (Corps of Engineers). The agency discussions do not constitute "projections" of Landsat data requirments,

but rather descriptions of data use. More detail should be provided.

B. The second paragraph of the DOI section (page VII.5-24) should be rewritten to state more correctly the value of higher resolution and stereo data. This paragraph, which now begins "Stereoscopic data are desired ...." should be replaced with the following text:

> Mapping applications of Landsat data would benefit from follow-on satellites with better spatial resolution and stereoscopic coverage capability, coupled with higher precision of spacecraft control. These improvements would allow topographic as well as planimetric maps at larger scale to be produced to meet National Map Accuracy Standards. Stereoscopic data would also be useful for geologic, geomorphologic, and terrain analysis.

4. System Improvements (section VII.6)

A. Future requirements for Landsat-type sensor systems have been omitted (counterpart to sections VII.6.3A-Geomet, VII.6.3B-Polar Met, and VII.6.4-Oceanography). Although the Government has no plans for follow-on Landsat satellites at this time, the RFP could identify desirable sensor improvements and additional applications that might be possible if new Landsat-type sensors were developed.

B. The RFP states that the "U.S. is exploring the possibility of direct readout of foreign remote sensing data by U.S. ground stations for experiment purposes"

(page VII.6-8; emphasis added). Although the emphasis in this section is on acquisition of data for research purposes, we suggest that it be clearly stated here and elsewhere (possibly section VII-8) that the U.S. Government will be free to acquire data from any foreign remote sensing system for operational as well as research purposes.

5. Financial Incentives

The RFP is not explicit on the financial incentive(s) available to the operator; this will create major difficulties in the evaluation and selection process. The acceptability of subsidies, guaranteed Government purchases, tax incentives, and/or other options should be allowed or disallowed. The use of terms such as "cost-plus-fixed-fee" and "fixed-price" further confuses this issue as these items are not appropriate to a long-term private initiative.

6. EROS Data Center Staffing for Landast Processing

Clarification is needed to the statement on Landsat processing which is done at the EROS Data Center (page VII.5-21, paragraph 2). The word "Landsat" should be inserted in the first sentence so that it reads "EDC has approximately .... with about 60 man-years directly identifiable to Landsat data handling and processing." Only about 20 per cent of the Center's manpower is directly involved with Landsat processing.

7. Landsat Data Pricing

Bidders are asked to provide estimated prices for Landsat products (pages VIII-18 and 19). However, the pricing schedule on these pages reflects only the currently available products. Bidders should be given the alternative to propose a different range of products, deleting those that they feel are not commercially viable and adding others that they believe would be desired by users.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Environmental Research Laboratories
325 Broadway
Boulder, Colorado 80303

November 2, 1983 R/E/SEL:RNG

MEMO TO: Ray Kammer, IB-COESS SEB Chairman

FROM: Richard N. Grubb, Chief Support Division, SEL

VIA: Vernon Derr, Director ERL
Harold Leinbach, Acting Director SEL

SUBJECT: Review of Draft RFP - Your request dated September 30, 1983

I have reviewed the Draft RFP on behalf of the Space Environment Laboratory. Unfortunately the RFP did not reach us in time to meet your deadline. The following comments are specifically concerned with the Space Environment Monitors (SEM) systems carried on the GOES and NOAA spacecraft. They are, in order of importance:

1. Section 6.0 NOAA requirements for the future, page 37.

The last paragraph concerning "Capabilility to fly the Solar Xray Imager ——— " should be placed at the end of Section 5 and removed from Section 6 since the x-ray imager is a GOES instrument and not a NOAA one.

2. Article 50 Meteorological Deliverable Items, page V-23, Space Environment Monitor Data.

The reference to the "electromagnetic spectrum" is confusing. Better wording would be:

"Data sets providing information on the local space environment and solar emissions providing the same temporal, spatial, spectral and energy resolutions as that provided by the SEM payloads on the current GOES and NOAA satellites (Reference Chapters VII.3 and VII.4)".

3. Section VII.4 Geostationary Operational Environmental Satellite (GOES) System.

Section 4A incorrectly describes the SEM as an "Associated Service" (4.A.2.e) using the transponders. It also refers to Appendix D for more information. There is no information on the SEM in Appendix D. The reference in 4.A.2.e to the SEM should be deleted. There is a proper description of the SEM and the SEM data requirements in Appendix C. This material should be used to expand section VII.4A to include the SEM since the appendix is presumably only for information.

4. GOES DCS System Appendix C and D.

The Space Environment Laboratory in conjunction with the U.S. Department of Interior utilizes the GOES DCP system to obtain data from a maximum of 24 isolated geophysical monitoring systems known as the Real-time Geophysical Observing Network (RGON). Since the reporting interval and organization of the platform data is unusual, it might be important for this use to be included in the various tabulations. Each site stores data from its sensors at one minute intervals and originates a data transmission taking eighteen seconds at twelve minute intervals. High channel efficiency is obtained by having each station time its transmission from the NBS time code.

5. Section 4C Proposal Requirements

Essentially the same paragraph. "Space Environment Monitor" appears twice, once on page 19 and once on page 22.

I am generally concerned by the lack of quantitative performance standards in the RFP. I hope that the vendors will be encouraged to provide hard, verifiable performance data for their proposed system in addition to demonstrating their understanding of the requirements. Without such data it would appear impossible for the agency users to hold the contractor to a satisfactory level of performance.

cc: V. Derr, ERL
H. Leinbach, SEL
R. Seale, SEL
W. Kleis, ERL Office of Programs
D. Hunt, OAR

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Research and Technology
Canada Centre for Remote Sensing
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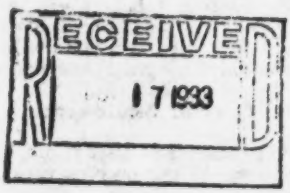
Your file / Votre référence

Our file / Notre référence

November 10, 1983

Ray Kammer, Chairman
Source Evaluation Board for
Civil Remote Sensing (COM)
NBOC#1, Room 300
11420 Rockville, Maryland
U.S.A. 20852



Dear Sir:

I appreciate having had the opportunity to review your draft Request for Proposal for Transfer of United States Operational Remote Sensing Satellites to the Private Sector. I will limit my comments to the civil remote sensing program.

As you know, Canada has actively participated in the U.S. remote sensing program throughout the highly successful LANDSAT program, and was the first country outside the U.S. to build its own reception and processing facilities. We feel that we have made a number of significant contributions to the program. For example, it was Canada which first proposed a global network of receiving stations for LANDSAT. The World Reference System now used universally was developed first in Canada, where it was known as the Fleming System in recognition of its designer. Canada also took a lead role in the development and eventual implementation of the LGSOWG (LANDSAT Ground) Station Operators' Working Group) Computer Compatible Tape format concept. Canada has also been one of the leaders in transferring the use of satellite remote sensing data and technology to operational resource management agencies. We believe that these efforts have influenced the program in a manner which has benefited all users of the data. Other ground station operators have made similar contributions. We hope that the final RFP will ask bidders to take into account the positive aspects of continued cooperation and collaboration with the operators of non-U.S. ground station. We hope that your evaluation criteria will adequately consider the degree to which the responses demonstrate an appreciation and understanding of the value of this cooperation.

While the RFP describes, in some detail, the current international framework for the operation of meteorological satellites, the information on current LANDSAT agreements is very skimpy. We would like to see a much more complete description of the role of the non-U.S. operations. As an appendix, a model copy of the current agreements could be included. The RFP should require responders to clearly state their intentions with regard to agreements with foreign operators, and their reasons for any change in current practice. There should be a strong incentive for the proposers to encourage continued, and even increased international cooperation.

The single greatest impediment to the use of remote sensing operationally is the uncertainty in the continued supply of data. Thus, it was surprising that continuity of data is considered a major goal for the meteorological satellites, but not land remote sensing satellites.

I would like to comment briefly on one of the issues mentioned in your covering memo, that of data ownership. Of major concern to us is the hint that the U.S. may consider deviating from its "open skies" policy. For over a decade, the U.S. at the U.N. has argued in favour of this as a desirable policy for all governments to follow. Your delegates have often made lengthy, sometimes most eloquent, speeches on this subject at U.N. meetings. They have argued that this policy is the only one which is "fair" to all countries. It is likely that, if the U.S. now backs away from its long-standing position, the clamour for "prior consent" will gain momentum, especially from the developing countries. I would also like to point out that the U.N. Committee on Peaceful Uses of Outer Space has agreed unanimously, with good support from the U.S., and year after year that a "sensed state" should have non-discriminatory and timely access to all data acquired over its territory. To violate this agreement would reduce U.S. credibility in the eyes of the international community.

I believe that any company which understands the market potential for timely remote sensing data will recognize that it is the repeat sale business which must be developed (i.e. renewable resource management) and that "open skies" offers the greatest market potential. Perhaps the recognition of this fact could be a measure of a bidder's ability to successfully tap the market.

Also on this subject, questions will arise concerning ownership of data acquired by the non-U.S. ground stations. Canada has a unique position vis-a-vis the other foreign operators since there is overlap in the coverage of Canadian and U.S. stations. For the LANDSAT-4 TM data, both the U.S. and Canada were able to exploit this overlap by sharing TM data, with NASA obtaining Eastern coverage of the Continent while Canada obtained western coverage. This resulted in considerable capital cost savings to both countries. The RFP makes no mention of this.

I hope that these comments are helpful to you. Our major concern is that there be a healthy, ongoing U.S. land remote sensing satellite program which will provide a continuous supply of data of the high quality we have begun to rely upon, and that we can continue to participate in the program to our mutual benefit.

Yours sincerely,

E.A. Godby

cc: R.C. Baker
W.M. Strome
Cockburn (Canadian Embassy to the U.S.)
M. Mosser (External Affairs)

UNCLASSIFIED
DEPARTMENT OF COMMERCE

INCOMING
TELEGRAM

PAGE 01 STOCKH 05421 231533Z 038378 DCE548
ACTION OES-09 24/0753Z
24/1510Z

INFO CCEN-01 OPS-01 4210-01 4211-01 4220-02 OGLE-01 NOAA-01
NTIA-03 /011 A4 L328

INFO OCT-00 COPY-01 ADS-00 AID-07 INR-10 EUR-12 SS-10
OIC-02 CIAE-00 DODE-00 H-01 IO-15 NSAE-00 COME-00
NASA-02 L-03 DOE-10 PM-00 ACL \-12 SP-02 /104 W
147681 248754Z /12

R 231528Z NOV 83
FM AMEMBASSY STOCKHOLM
TO SECSTATE WASHDC 9948

UNCLAS STOCKHOLM 05421

E.O. 12356: N/A
TAGS: TSPA KSCA SW
SUBJECT: COMMERCIALIZATION OF METSAT AND LANDSAT

REF: (A) STATE 289633, (B) STATE 298729

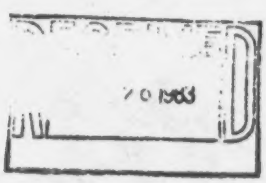
SEB
PPI
E/ERI
WXB
11/25

1. INFORMATION OF REFTELS WAS CONVEYED TO GOS FOREIGN MINISTRY AND SPACE AGENCIES) ON ARRIVAL. MFA OFFICIAL FOR SPACE AFFAIRS DELIVERED COORDINATED SWEDISH COMMENTS TO SCICOUNS ON NOV 22.

2. SWEDEN HAS NO GENERAL OBJECTIONS TO US SATELLITE COMMERCIALIZATION POLICY AS OUTLINED IN REFTELS. REPRESENTATIVE POINTED OUT THAT SPOT REMOTE SENSING SYSTEM, IN WHICH SWEDEN IS ACTIVE PARTICIPANT, IS ALSO PLANNED TO BE COMMERCIALIZED.
3. IN REGARD TO METSAT SWEDEN FINDS US PLANS ACCEPTABLE IF PERMANENT. GOS IS JUST MAKING SIZEABLE NEW INVESTMENTS AT INSTITUTE OF METEOROLOGY TO HANDLE METSAT DATA.

4. SWEDEN FEELS THAT IT IS VERY IMPORTANT TO KEEP NON-DISCRIMINATORY ACCESS TO LANDSAT DATA AND NOTES US POLICY STATEMENT RE CONCURRENCE WITH CHANGES WITH

SATISFACTION. GOS ALSO HOPES USA WILL CONTINUE TO PROTECT THE INTERESTS OF DEVELOPING COUNTRIES IN REMOTE SENSING AREA. FORSBERG



UNCLASSIFIED

CONTROL DATA
8100 34th Avenue South
Mailing Address/Box O
Minneapolis, Minnesota 55440

November 4, 1983

Ms. Lynne Draper
Committee on Science and Technology
2324 Rayburn House Office Building
Washington, D.C. 20515

Dear Ms. Draper:

Control Data Corporation is submitting six copies of its response to the draft bill on the commercialization of civil land remote sensing. We have made some statements which embody our views on such a transition. Additionally, as an attachment, we have commented on specific sections of the proposed bill.

We hope to be a participant in activities bearing on the Government's proposed course of action, and we are interested in any subsequent steps in the legislative process.

Sincerely,

Walter H. Bruning, President
Computer Services Company

0916h/lg

Enclosures

Dear Chairman Scheuer, Chairman Volkmer, Members of the Subcommittees; we are pleased to share Control Data's views relating to the proposed legislation.

In general, we approve of government actions to transfer governmental functions to the private sector when it makes sense to do so. As users of remotely sensed data, we have no parochial views concerning commercialization. Our view is simply, if any part of the program is to be transferred, we want to position ourselves to be competitively involved. Our concern with the proposed legislation is that many areas lack clarity, to the extent that a business enterprise may not prudently assess its risks. The unquantified nature of each separate title of the bill may make it unattractive for private investment.

Control Data's interest in the remote sensing program is bidirectional. First, we are users of the data. We have been providing information services to the Petroleum, Geological, Agricultural and Meteorological communities for over twenty years. Second, with our data processing and marketing capabilities, we believe we are a viable, indeed, a key, potential participant in the commercialization process in whatever manner it develops.

Your draft legislation and one similar to it, introduced in the Senate, has come none too soon and is certainly needed. We feel that the spirit of your draft is right on target. We have provided as an attachment, detailed comments to your draft Bill for your consideration.

Certainly it is important to maintain United State's leadership in earth remote sensing technology. It is vital, however, that we develop applications to use the data, in concert with other data, to assist us in better management and development of our renewable and non-renewable resources. Given, that most of the effort in these areas will be in the province of the private sector which is better able to develop the marketplace, the Landsat program is a viable candidate for commercialization.

For the purpose of our response, we define commercialization as transitioning from a government, technology-driven program to a profitable, market-driven business. A mere transfer of existing Landsat assets to the private sector may be a necessary first step, but it is a far cry from successful commercialization.

We and other interested companies, as well as the government have used conventional market assessment techniques. The result is that the current and near-term market projections are insufficient to recoup the cost of operations in the near-term without a partnership between the U.S. Government and the private sector.

We submit that commercialization will succeed only if there is a vision that it is right and a will, by the Congress, to get it done cost-effectively. Thus, it is our belief that a partnership between government and private industry is required. The degree to which each contributes needs to be determined.

It appears that the Department of Commerce's Source Evaluation Board has the vehicle to present you with private industry's assessment. Optimally, your legislation and the SEB's proposal will contain the same factors and conditions in order to prevent confusion on the part of the bidders. However, if you limit the private sector too much and at the same time fail to provide adequate incentives, then commercialization will fail.

In conclusion, it is necessary to see a clear commitment for the United States to stay in the field of earth remote sensing and the continuity that it implies. Further, responsible partnership, wherein the private sector through product development, marketing, sales, reduction of cost of operations gradually reduces government financial involvement to that of any potential customer is the goal we all wish to attain. We hope this document will be helpful to your subcommittees. We would be willing to amplify on these points if requested.

ATTACHMENT 1

COMMENTS ON THE REMOTE SENSING DRAFT BILL

TITLE I

Sec 101

It is gratifying to see a clear statement that the United States should stay in the field of remote sensing of the earth as well as statements encouraging cooperation between the private sector and government to accomplish this task in partnership.

Paragraphs (6) and (11) and later sections seem to conflict with the findings of paragraph (9). "Minimum subsidy" and minimum "government support" are often taken as mandates to exclude alternatives important to a successful transition.

Sec 102

Continuity has a much broader interpretation than you have defined as simply continuity of a specific data stream. It is the continuity of a capability and the assurance to the commercial marketplace of a stable, reliable program of remote-sensing for each of the areas of land, ocean, and weather.

"Non-discriminatory access to these data" pervades many sections of the Bill; its definition later seems to preclude volume pricing and other conventional pricing practices.

Sec 104

Under definitions, a suggested list of additional terms with proposed definitions is included but not limited to:

- o "Continuity of data" means providing the assurance of a stable, reliable program of remote-sensing.
- o "Partnership" means a multi-year appropriations commitment by government to enter into a contract with the private sector to determine the viability of a commercial enterprise and to have the private sector develop a market driven, profitable information business.

- "Commercialization" means the transition from a government, technology-driven program to a profitable, market requirements-driven business.

The contract defined under Section 302 has a specified time frame of six years and we suggest that this be extended to not less than twelve years.

TITLE II

To separate the continuation of the present Landsat operations from the transition functions stated in Title III of the legislation seems to complicate the commercialization process. The commercialization process begins with the transition from government operation to a private sector operation, but it is only the first step in achieving a market-driven, viable business. The separation particularly complicates the partnership between government and the private sector vendor(s) chosen through a competitive process to accomplish the task of commercialization.

To split the present operation from the responsibilities of the future commercial, private sector program does not connote continuity of a land remote sensing program as we have attempted to clarify it under our comments on definitions (Sec 104).

Sec 201 (a)

The partnership between government and the private sector vendor(s), once determined through a competitive process, needs to be stable and on a long term multi-year basis. Throughout the Bill, there is the question of how the contractor recovers investment losses if appropriations are discontinued.

Sec 201 (c)

Any contract award must be of sufficient duration to allow adequate performance measurement and recovery of financial risk.

Sec 202 (b)(1)

The commercialization process is hindered if the space and ground readout functions of the total program are separated from the value-added processing and marketing functions of the program. In the commercialization process, we have found that in order that the marketplace requirements drive the technology and product development, a total "end-to-end" system must be coordinated under a central management team. In this way, a viable business is established faster and government will be able to transfer financial responsibility to the private sector more rapidly.

Title III

Sec 301 (a)(3)

The definition of continuity which we recommend you adopt for your legislation has a much broader meaning than you have stated. Our recommendation is based on our discussions with end-users and "value added" service companies in the geology, engineering and construction industries. To these market segments, continuity of earth remote sensing means more than continuity of "MSS" data solely. It means continuation of a viable and reliable information system from space which they can count on, so that investments into the use of the data streams will be cost-effective. It also means to us that the program will develop new and/or improved data types including but not limited to thematic mapper data and stereo data.

It must be concluded from our market survey that if you as government require "MSS" data then you become the major, possibly the only customer for this data. The cost to the government as a sole user may be prohibitive. For example, the Geology community shares a 4,000-5,000 tape library of the "MSS" data for the world. They need new and unique data to add to their exploration data bases to assist them in making their drilling decisions and their continued interest in "MSS" data is minimal.

To date, all the studies completed for government estimate that the time frame for Landsat commercialization will take ten years or more. Therefore, the time of six years appears to be too restrictive and we suggest it be revised upward or a specified period be eliminated.

An important suggestion is that government truly envision a partnership with the private sector on this venture and minimize the restrictions included in this draft legislation. Non-essential restrictions or requirements placed upon the new commercialization entity will cost the government and potentially limit the entrepreneurial character of this new entity which we feel is essential to its success.

Sec 302 (a)

We recommend that the government commit to multi-year appropriations within this commercialization contract in order to assure the private sector that a change of administration or Congress will not result in the arbitrary decrease or cancellation of funding by government, leaving the private sector vendors to lose large investments they have incurred in this venture. This contract will need to be more than a

standard contract to build an aircraft or weapon system. It will need to be structured to safeguard both government and the private sector vendors, but at the same time sufficiently flexible to allow the partnership to succeed in the commercialization program.

Sec 302 (f)(1)

In our proposed multi-year partnership for commercialization, we seek a long-term, financial requirement upon the government; therefore, this section seems to be too restrictive.

Sec 302 (g)

You allow the secretary, as a result of failure to consummate a contract with private industry, to request procurement and operations of a data system generating higher quality data streams than "MSS" data. It seems that such flexibility is required for the private sector vendor(s), rather than restricting development of new data streams to the cost of the contractor.

Sec 303

The draft legislation would need to be modified to reflect recommended changes you might incorporate from the previous sections.

Sec 303 (b)

Since the production of data under this section is specified to be at the expense of the contractor the government should not be entitled to a royalty.

Sec 304

Control Data recommends that the review cycle for this contract be increased along with lengthening of the total contract period. It is our considered recommendation that a four-year review cycle be incorporated along with a change of the total contract period to not less than 12 years. Specific conditions for termination of contract can be stipulated in the legislation. However, they should be broad and flexible, the partnership between government and the private sector must have a high probability of succeeding even under adverse economic, social or political conditions.

TITLE V

Sec 501

We suggest that the requirement for research and development continue to be the purview of NASA and that a cooperative group made up of the private sector (including the land remote sensing contractor) and NASA be established to bridge the present gap between user's requirements and the government R&D programs.

Sec 503

If the data gathered in federal experimental remote sensing programs is competitively sold, then government is inhibiting market growth in a manner which it expresses a desire to avoid as stated in Section 103(b).

e5754H-9

December 19, 1983

1101 Fourteenth Street, NW
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Washington, DC 20005
Tel: (202) 683-2166

Mr. Robert Palmer
Science Consultant
SubCommittee Natural Resources
Agriculture, Research and Environment
House Office Building No. 2 (Rm. 380)
300 D Street, SW
Washington, DC 20515

Re: November, 1983 Hearings on Draft Bill on Landsat Commercialization

Dear Bob:

On behalf of Dr. Robert K. Vincent, President of GeoSpectra Corporation, I have enclosed for your review and for inclusion in the record for the above-captioned hearings a short written statement on the desired role of the Government during the transition toward greater commercialization of the Landsat System.

This statement is excerpted from a concept paper prepared by Dr. Vincent on a proposal ("Multi Spectra") to establish a company to own and operate a commercial Landsat receiving station.

If you have any questions regarding this matter, please contact me.

Sincerely,

Bernard J. Cooney

Bernard J. Cooney

BJC/lsm

Enclosure

cc: w/o enclosure
Dr. Robert K. Vincent

5.0 DESIRED ROLE OF THE U.S. GOVERNMENT

Compared with the celebrated COMSAT proposal to the federal government, which asked for federal subsidies of $360 million per year and a buyout of the NASA LANDSAT satellite program for $300 million, the desired role of the federal government proposed here is much simpler, much less costly to the taxpayer, and far less risky from the standpoint of future viability of the U.S. remote sensing effort. First, NASA would be asked to sell M.O.U.'s to any private receiving station in the U.S. at the same annual rates as are charged to foreign LANDSAT receiving stations. Second, the U.S. government would be asked not to compete in any way with private LANDSAT receiving stations, once they are in operation. This means that the U.S. government would cease the sale of any LANDSAT data to any non-federal user. Such sales would be made only by private receiving station(s). Third, NASA would continue the funding of LANDSATS IV and V and continue the funding of new types of remote sensing satellites, such as the imaging spectrometer, on an experimental basis only. Experimental would be defined as testing these new satellites only while the Space Shuttle is in orbit and bringing them down after its orbital testing. This would produce enough data to whet the appetite of the user community through sales of the experimental data. This experimental data would be wholesaled to private LANDSAT receiving stations, who would make them available to all non-federal users. NASA would be taking the risks associated with new sensor technology, just as it has in the past, but it would be out of the operational remote sensing business, as would NOAA, if the private receiving station is successful. The EROS Data Center would become a supplier of federal government users and an archiver of data from LANDSAT that was sold by the private receiving station, yet was nonredundant with LANDSAT data archived from government receiving stations.

Let us now consider the consequences of both the successful and unsucessful attempts of private industry to fully commercialize remote sensing. If one or more companies successfully deploy ground receiving stations for LANDSAT data, NOAA will be relieved of the responsibility of its operational requirements for non-federal users and at the same time gain the opportunity of obtaining LANDSAT data for federal government users from receiving stations that it does not have to purchase. This would have been very useful during the brief operating history of LANDSAT IV, which did not have the benefit of the TDRS relay satellite. It also would help during any future TDRS inactivity and during overflow situations when the government receiving and processing facilities cannot handle all the data that federal users require. If companies, encouraged by the success of private ground receiving stations, launch private remote sensing satellites, the federal government can then purchase data from these satellites on an as-needed basis

without any capital costs to the government. Best of all, the commercialization of space will have been a success and, with NASA continuing experimentation with new remote sensing technology, the cooperation of American business with the U.S. government would assure successful competition with foreign entities in remote sensing technology while at same time preserving the kind of private- government interaction that has been politically acceptable in the past.

Consider now the worst case scenario, where no private receiving stations and no private remote sensing satellites are successful. In this case, NOAA still will have a LANDSAT receiving station which can serve both federal and non-federal users, albeit with less capacity or through-put than may be desired. NASA will still have launched LANDSATS IV and V, which would be identical, and it would have an experimental imaging spectrometer satellite which it could then fly operationally for NOAA if no private satellite is launched. In other words, the continuance of U.S. dominance in Earth resources remote sensing would be assured in either case. This would be far better than placing all our eggs in one basket and gambling the entire future of U.S. remote sensing on the success on one private entity.

The argument that private receiving stations and private remote sensing satellites are not commercially viable should be put to rest because it is based on prices of experimental technology that is by now outmoded. Whereas it is true that previous LANDSAT satellites have cost on the order of $150 million to build and launch, it is now possible to build and launch an imaging spectrometer satellite with no moving parts and with far greater spectral resolution and diversity that the Thematic Mapper at a cost of approximately $35 million. Even if the market were no greater that the $12 million now received by NOAA for worldwide LANDSAT data sales, such a private remote sensing satellite would be economically feasible, paying for itself in three years. Private industry should be encouraged to launch such new technology without endangering the U.S. lead in remote sensing technology. The above proposed role for the U.S. government would accomplish this goal.

COMMUNICATIONS SATELLITE CORPORATION

JOHN L. McLUCAS
Executive Vice President and
Chief Strategic Officer

December 7, 1983

Honorable James Scheuer, Chairman
Subcommittee on Natural Resources,
Agriculture, Research & Development
U.S. House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

We appreciate the opportunity to submit a statement on draft legislation you have under consideration regarding land remote sensing commercialization. We ask that this letter be included in the record of your recent hearings on this subject.

As the Committee is aware, COMSAT has had a continuing interest in commercial satellite remote sensing. We were early advocates of the commercialization of the Government systems and have presented testimony before the Committee on this subject numerous times beginning in 1977. The most important objective of any legislation must be to clearly state a U.S. policy on the commercialization of remote sensing so that the United States can proceed with the task of asserting and maintaining commercial leadership in a field the U.S. has pioneered technically. In the face of the growing foreign competition,often with explicit or implicit foreign government assistance and encouragement, U.S. leadership is jeopardized.

COMSAT believes that the commercialization of remote sensing would provide many benefits to the United States. For example, commercially driven marketing of remotely sensed data would expand the usages and number of users of remotely sensed data. A larger market, in

950 L'ENFANT PLAZA, SW • WASHINGTON, D.C. 20024 • TELEPHONE 202-863-6087

turn, would reduce the unit costs and encourage new competition to enter the field. Users will thus benefit not only from lower prices but from greater selection of services.

We believe that both the data user and the U.S. taxpayer stand to gain by the commercialization of remote sensing operations. However, to make commercialization successful we believe that the Government should provide reasonable incentives and at a minimum remove unnecessary regulatory and other barriers that might inhibit private companies from committing the time and resources necessary to gain entry into this new and untried market. Our suggestions as described below could be incorporated easily into your draft legislation.

The draft bill provides for the commercialization of current as well as future systems. However, we believe that a transfer of the Government's existing Landsat system to the private sector is not needed at this time. We believe the best approach is to continue Government operation of Landsat 4 and D' as a research and development effort through 1986 or 1987, when Government ownership and operation of remote sensing satellites can be transferred to private industry. The transfer of the existing Landsat system is undesirable because the process of the transfer would likely extend well into the useful life of the space segment. Moreover, it is improbable that legislation for transfer, if approved, could be implemented until late 1985 or 1986. In view of the time required for the issuance of the RFP and the response and resulting negotiations, there would likely be only a year or so of useful spacecraft life remaining. It would not be practical to change system operators at such a late date since the transaction costs to the Government could exceed those of continued operation.

At the same time, in our opinion, Government expenditures for a follow-on system (i.e. after Landsat 4 and D prime) should not be made; rather, private industry should be encouraged to supply the remotely sensed data required by the Government and other users after 1986. Legislation can set the framework and context within which private industry can begin to plan now to assume this responsibility. An essential first step in encouraging industry interest is for the U.S. Government to develop estimates of the type and quantity of data and data products it needs.

Regarding specific features of the draft land remote sensing commercialization legislation, we have several observations that we hope will be of assistance to the Committee. First, Title II of the legislation would require a contractor to set up an organizationally-separate business unit to provide enchanced services. We feel that this provision would discourage potential participants since it would add another layer of costs to the business and insulate the contractor from the ultimate market. Furthermore, foreign competitors would not be subject to these limitations. The U.S. contractor should not be put at a competitive disadvantage. In the long run, this restriction could inadvertently assist foreign competitors in gaining control of world-wide remote sensing markets.

Title III provides for the establishment of a contract between the Department of Commerce and a single source to provide remote sensing data after Landsat. We feel that a single source contractural arrangement is unnecessary given current circumstances and could serve as a market barrier to the entry of other qualified companies in remote sensing activities.

In addition, Title III authorizes a "pre-payment" by the Government to cover a portion of the capital costs of a selected company in providing data continuity following the end of Landsat operations. We feel this provision is undesirable since it provides an incentive to only one company (the successful bidder), and could inhibit alternative private financing of satellite remote sensing systems. Congress should consider creating incentives to encourage a multitude of firms to enter the business, so that Government agencies and users could choose from a variety of data and information products.

Finally, each Government agency has different needs which could require different remote sensing systems. Because it is unlikely that a single Government contract could meet those diverse needs satisfactorily, it may be appropriate to authorize each agency requiring data to procure that data directly. This would further stimulate a diverse supply of data.

The draft legislation also would establish a licensing procedure for the private sector to operate remote sensing satellite systems. It should be noted that at present, authorization and operation of remote sensing activities by U.S. companies are governed by various existing regulatory provisions. These provisions include export control programs administered by the Departments of State and Commerce (with Defense and other agency participation), launch agreements for the use of the NASA transportation systems, and FCC construction permits and frequency licenses. While one-stop regulation would be desirable, it is very difficult to achieve. Additional licensing mechanisms for remote sensing operations are, in our opinion, unnecessary and undesirable.

The draft bill allows for continued Federal remote sensing research and development activities. While we agree with the need for the potential benefits of such research, care must be taken to ensure that any program is truly R&D. The Government cannot expect commercial entrepreneurs to invest in remote sensing systems if Government R&D programs are run in a manner which draws business away from the commercial markets.

Title VI authorizes the Secretary of Commerce to provide storage and maintenance for data and stipulates that data shall not be reproduced and disseminated by the purchaser. We believe that commercialization stands the best chance to succeed if the data generated by a private company are proprietary and remain in its possession. The Government procures what data it needs through an appropriate agreement. Of course, any commercial operation would be subject to national security and defense requirements and controls. We see little need for the Government to obtain and store any remote sensing data beyond its user needs.

In addition, Section 603 of the draft legislation would prohibit the purchaser of data products from subsequently reselling those information products to another party. While we have no disagreement with the intent or substance of this provision, it appears to be a departure from existing anti-trust law, which generally provides that once title to an object changes hands, the original seller is prohibited from placing restrictions on the future disposition of that object. The Committee may wish to consider these potential anti-trust implications to determine if the

intent of this provision could be achieved through other means.

In summary, while we support the Committee's intention to facilitate the transition of remote sensing from the Government to the private sector, modifications are necessary to the proposed legislation if it is to create an attractive opportunity to the private sector for commercialization of remote sensing systems. Some of the conditions we have discussed above could inhibit private concerns from undertaking the considerable investments necessary for commercialization. Given the technical risks, added regulatory procedures and market uncertainties, operation of future systems would not appear attractive enough under this proposed legislation.

Again, we appreciate your including this statement in the official hearing record on remote sensing legislation. In addition to our comments, we are enclosing a recent letter to Mr. Raymond G. Kammer of the Source Evaluation Board for Civil Space Remote Sensing, which contains our recommendations on the remote sensing draft RFP.

Sincerely,

John McLucas

John L. McLucas

Enclosure

GENERAL ELECTRIC
COMPANY
SPACE SYSTEMS DIVISION
VALLEY FORGE SPACE CENTER
P. O. BOX 8555 PHILADELPHIA, PA. 19101

November 9, 1983

A. J. ROSENBERG
VICE PRESIDENT AND
GENERAL MANAGER

The Honorable James H. Scheuer
Chairman, Subcommittee on Natural
Resources, Agriculture Research
& Environment
U.S. House of Representatives
Washington, D.C. 20515

The Honorable Harold L. Volkmer
Chairman, Subcommittee on Space
Science and Applications
U.S. House of Representatives
Washington, D.C. 20515

Gentlemen:

Thank you for providing me the opportunity to comment on the Land Remote Sensing Commercialization Act of 1983. I welcome the Subcommittees' initiative in addressing the issues surrounding the nation's land remote sensing program as exemplified by the draft legislation.

On July 23, 1981, I testified before a Joint hearing on Senate and House Subcommittees regarding the process for achieving an operational land remote sensing capability and the role of the private sector. At that time, I urged that the government provide for data continuity as an essential ingredient of any viable program. Continuity requires the procurement of additional satellites, and I seriously question the feasibility of the private sector guaranteeing continuity when the key issue involves the lack of a sufficiently developed market to sustain a private sector commercial venture. Without a sound definition and understanding of the real market prior to initiating such a venture, I have serious reservations about the economic viability of the enterprise. Also a major government subsidy and give-away of assets does not constitute commercialization in my view.

For the past two years, the important Landsat program issues have been overshadowed by a rush towards commercialization of the total remote sensing system, and in particular by the on-going debate over the role of the weather systems. The recent House-Senate Joint Conference action on the FY 84 Commerce Appropriations Bill should clarify the role of weather systems in the commercialization process and enable the Congress and the Administration to focus specific attention on the Landsat program.

The nation is at a critical decision point regarding the long term viability of the land remote sensing program. The critical issue involves assurance of data continuity, and the issue must be resolved now. Unless action is taken now, foreign competitors will capture the market and the United States may well find itself in the position of having to rely on foreign sources for data in an area in which we are now pre-eminent.

One recommendation, therefore, is that you consider changing the title of the legislation to "The Land Remote Sensing Continuity Act of 1983". This action will be a clear indication to the land remote sensing community that the Congress considers continuity to be the critical issue. Specific steps can then be taken to determine the appropriate mechanism, recognizing that only the government is in a position to guarantee data continuity and that the strength of the private sector lies in developing and marketing products and services. In my opinion, assuring an on-going land remote sensing system is a proper role for the government.

Technology leadership and data continuity are key purposes of the legislation. By assuring continuity, the United States has the opportunity to maintain its leadership, achieved via a decade of commitment to the Landsat program. Also, as Landsat enters its operational phase, benefits will continue to flow to domestic and world wide users through this decade into the 1990's.

I have enclosed some specific comments on the draft legislation which assess the proposed implementation approach. I also recommend an alternate approach which supports the intent of the legislation and provides for a near term period of market development, an essential activity to help guide future planning effort.

Very truly yours,

Allan J. Rosenberg

20-901 O - 84 - 84

GENERAL ELECTRIC

SPACE SYSTEMS DIVISION
GENERAL ELECTRIC COMPANY • VALLEY FORGE SPACE CENTER • P.O. BOX 8555 • PHILADELPHIA, PENNSYLVANIA 19101 • (215) 962-2000

Comments On "The Land Remote Sensing Commercialization Act of 1983"

LANDSAT PROGRAM BACKGROUND

Landsat-4, the fourth in a series of earth resources satellites, was launched in July 1982, carrying a sensor complement that includes the Multi-Spectral Scanner (MSS) and the Thematic Mapper (TM). The MSS is a four-spectral band, 80-meter resolution sensor similar to those flown on previous Landsat missions. TM is a new, developmental sensor, with seven-spectral bands and 30-meter resolution capability. The MSS was declared operational in January 1983, while the TM will remain in a research and development evaluation mode until January 1985, when it will be turned over to NOAA for operational use.

Since Landsat-4 was launched, failed power cables on the spacecraft's solar array have resulted in a gradual power reduction. Despite this situation, an operational MSS mission is being carried out, while R&D activity with the TM is being supported via an archive of more than 2000 scenes acquired during the first nine months of operations. Development of the ground data processing capability to support both the TM R&D and operational phases is in process. A significant program milestone was achieved in late October 1983, with the successful demonstration of a processing capability exceeding 12 scenes per day; 50 scenes per day (fully processed) capability is planned for January 1985.

It is anticipated that approval of the funding for the launch of Landsat-D' is imminent, with launch targeted for March 1, 1984. While the design life objective for Landsat-D' is three years, it is felt that a longer life can be anticipated, since all of the known anomalies encountered in the operation of Landsat-4 have been corrected on the Landsat-D' vehicle. The current Landsat program situation is depicted in Figure 1.

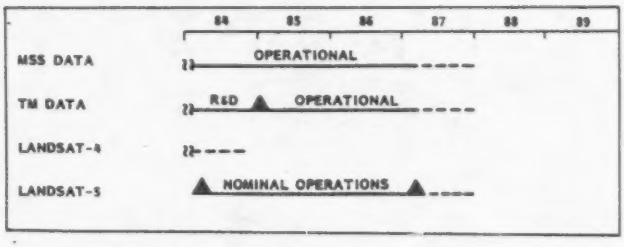


Figure 1 Current Landsat Program

It is anticipated that TDRSS-B (TDRSS WEST) will be launched in the fall of 1984, joining TDRSS EAST to provide a global Landsat data relay capability. A highly successful test of the Landsat-TDRSS Ku-band primary data communictions link was conducted in August 1983, and provided confidence for future routine data acquisitions. In addition, several Landsat foreign ground stations will be coming on-line in 1984 with X-band direct readout capability for TM data reception. Thus, the foundation is in place for an operational Landsat system capable of delivering data products and services to users on a routine, quick-turnaround basis through early 1987.

THE DATA CONTINUITY ISSUE

Beyond Landsat-D', no plans exist for follow-on spacecraft. The time to make the necessary decisions required to avoid significant gaps in Landsat data is eroding. As shown in Figure 2, a commitment to Landsat-D" at the beginning of 1984 with the procurement of long-lead items would result in a spacecraft ready for launch in early 1988, creating a potential data gap of up to one year.

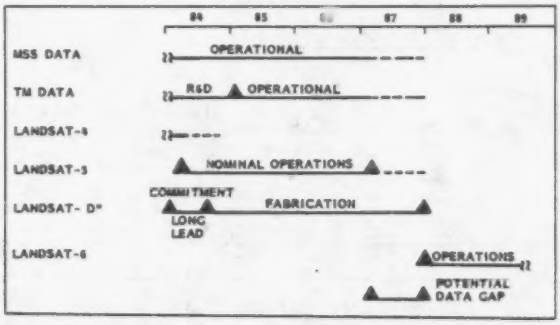


Figure 2 Landsat Data Continuity

Without such a commitment to assure the continuity of the Landsat system, the decade of investment which established the readiness for the operational phase and enables the U. S. to reap the benefits of its world leadership position, will be meaningless. Given the lack/absence of data continuity, both current and potential users of the system may well turn to foreign sources for comparable information. It is not inconceivable that the most prominent users of Landsat data - agencies of our federal government - could be placed in the untenable position of relying on foreign sources for important global earth resources data. To avoid the possibility of this happening, the issue of Landsat data continuity must be addressed now.

FOREIGN COMPETITION

The most significant competition is expected from SPOT, the French subsidized system, planned for launch in 1985. The sensor on the spacecraft has four spectral bands, resolution of 10-20 meters (an improvement over the current U.S. system), and stereo data acquisition capability. The German government has supported the development of the Modular Optical Multi-spectral Scanner (MOMS) sensor. The new Sparx consortium intends to capitalize on the recent successful initial flight on STS-7 with a series of shuttle-launched missions using the retrievable SPAS platform. The MOMS sensor will eventually have four bands, 20-meter resolution and stereo capability, similar to SPOT. The planned availability of these capabilities, vis-a-vis the Landsat system, is shown in Figure 3.

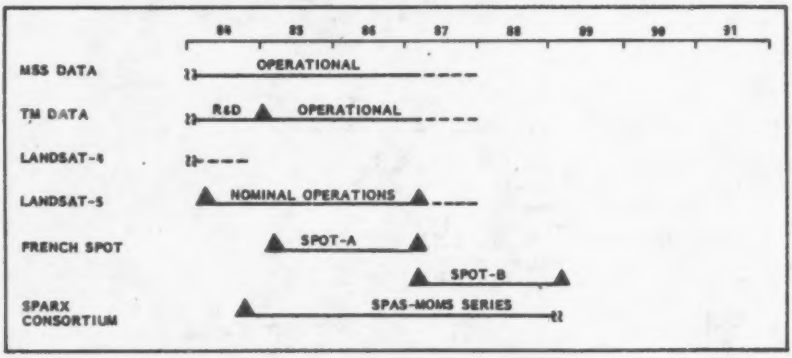


Figure 3 Foreign Competition

The critical point is that the foreign supported systems have follow-through commitments. Moreover, with the significant capabilities planned, they will, in the absence of a commitment to continue the Landsat system, take over U.S. technology leadership and draw user interest away from Landsat.

The Thematic Mapper is a very capable sensor. The initial R&D results are substantiating its usefulness, not only for an expanded set of applications but for an enhanced resource discrimination capability as well. These advancements are due to the increased resolution (30 m or better) and the new short wave IR and thermal spectral bands (features absent in the foreign systems). Therefore, the United States has the opportunity to maintain its technology leadership, provided it commits to continuity beyond the last planned satellite (Landsat-5).

Also, this country should continue its pursuit of an aggressive remote sensing R&D program for future advancements in sensor and information extraction technology.

DRAFT LEGISLATION ASSESSMENT

The assessment of the draft legislation's approach to continuity is presented with the previous discussion of the Landsat program and foreign competition in mind. Figure 4 depicts anticipated implementation phases for Title II and III (assumes a bill enacted in mid-1984).

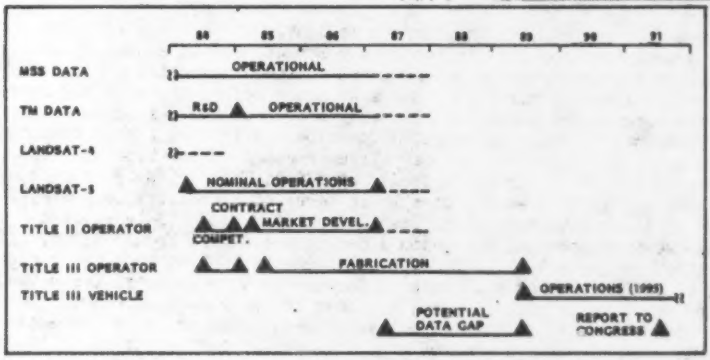


Figure 4 Draft Legislation Implementation Approach

TITLE II

The objective of this phase is the initiation of market development activity in advance of the Title III operator bringing follow-on continuity satellite systems on line. The key concern about Title II is that the anticipated Title III continuity capability encourages only MSS level data, because that's what the government would subsidize. Once the Title III approach is selected, and assuming it is MSS (or at least not TM), the availability of TM data, on an operational basis to serve user needs, becomes moot. The foreign subsidized competition offers higher resolution and features such as stereo which would have a significant adverse impact on the ability of the operator to develop a market for the sale of MSS data.

Unless the Title II and III operators are the same (and this is highly unlikely given the differences in the ventures involved), the Title II operator is not apt to be motivated to aggressively develop a market for which someone else will gain the benefit. Since there is no transfer of assets planned in Title II, the operator would have no incentive to make investments in upgraded, or new data processing/dissemination facilities, to support market development activity.

It appears that Title II would only result in a "business as usual" approach, with the contract in the hands of a new operator, rather than the government and its current set of contractors/support organizations.

TITLE III

The objective of this phase is to assure data continuity via a government subsidy with some level of private sector investment, and to establish a basis for eventual full private sector ownership/operation. A significant concern is that the competition for this role would take place before there is any hard evidence establishing the potential of the market, especially in a competitive market environment. Foreign competition described earlier will have captured a significant share of the market and be well entrenched by the time the Title III system comes on line. Having progressed from MSS to TM over the past decade, our government should not regress to a lower level of capability, especially when the TM is proving to have significant advantages over MSS-level data. The TM, SPOT and MOMS sensor data sets should define the market from 1985 on. If there is little or no market for MSS data in the late 1980's, then the venture will fail, or the government will have to provide additional subsidies beyond the intended one time infusion. Also, MSS does not provide technology leadership in the face of foreign advancements and, since it is the same old 80-meter visible channel data, it cannot contribute to market expansion in the form of new applications as TM can. If the government anticipates that the private sector operator will fly a sensor with capabilities beyond the MSS at its own cost, the same questions arise about market definition during an early competition.

Title III also calls for a report to the Congress on the feasibility of the private sector taking over full ownership/operation two years after initiating the data continuity service. This report would be available about 1991 (based on nominal assumptions for contract initiation, satellite fabrication and launch). Thus, approximately seven years after enactment of the legislation, the Congress may find out that commercialization (at least on this basis) won't work and all of the interim time and opportunity will have been lost.

RECOMMENDED APPROACH

A more realistic approach requires an immediate commitment, by the federal government, to the fabrication of Landsat-D" as the continuity vehicle, primarily for TM purposes. The objectives of this approach are to:

(a) Assure data continuity, with minimum data gaps
(b) Maintain technology leadership and user support
(c) Enhance market development
(d) Provide an earlier report to the Congress

These objectives are in concert with the purposes and intent of the draft legislation. And, inasmuch as contractor organizations are in place to accomplish this, valuable time and resources do not have to be devoted to competitive considerations. A nominal four-year fabrication plan would provide a continuity satellite in early 1988, minimizing the potential data gap beyond the nominal end of Landsat-5 operations. Spacecraft operations would remain within the government using existing and planned contractor arrangements. The government can initiate competitive actions to bring private sector experience to bear on market development, a key issue in remote sensing. In this approach, a contractor would assume responsibility for market development for Landsat data products and services in an operational environment (described earlier) where there is assured continuity into the early 1990's. The market developer has something to sell (TM data), reasonable/solid assurance that the service can be delivered and the opportunity to reap over a longer period the benefits of the market developed.

Figure 5 demonstrates the relationship of the Landsat-D" spacecraft to Landsat-5 operations, and the role for market development.

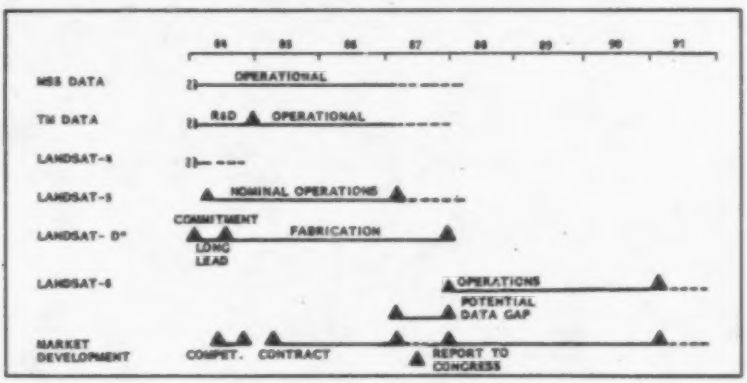


Figure 5 Recommended Approach

In a broad sense, this is similar to the approach taken by the French, wherein the assets are provided by the government and the private sector, SPOT Image, has responsibility for data sales, distribution and market development.

The government should require the preparation of a report after two years of market development activity (nominally in 1987) to describe the then current and projected market. This market should have been developed in an operational environment, with continuity assured and in the face of foreign competition. Approaches to the follow-on to the Landsat-D" program for the 1990's can then be evaluated while sufficient time remains to make the commitments necessary to provide an on-going program.

7 November 1983

Honorable James H. Scheuer
Chairman
Subcommittee on Natural Resources
Agriculture Research and Environment
Suit 2324
Rayburn House Office Building
Washington, D. C. 20515

Dear Congressman Scheuer:

We wish to thank you and the members of your Subcommittee for the invitation to testify during the joint hearings on House of Representative Draft Bill of October 26, 1983. Kodak has developed extensive knowledge and experience in optics and imaging and has studied many aspects of satellite systems. We are, therefore, interested in the future of the land remote-sensing satellite programs.

We have carefully reviewed the four issues outlined in your letter of October 27, 1983. We have concluded that we are not in a position to materially assist the committee by testifying on these issues during the hearings. We have, therefore, decided to decline your invitation to appear.

We believe it may be of assistance to the Committee to be aware of some recent technological developments which have not yet been incorporated in satellite systems. We have prepared and enclose a brief written description of this work and ask that it be included in the written record of the hearings.

Sincerely,

George T. Keene

George T. Keene

GTK:sv

Enclosure

TESTIMONY BEFORE
THE
U.S. CONGRESSIONAL SUBCOMMITTEES
ON
SPACE SCIENCE AND APPLICATIONS
AND
NATURAL RESOURCES, AGRICULTURAL RESEARCH AND ENVIRONMENT

George T. Keene
EASTMAN KODAK COMPANY

Mr. Chairman and members of the committee; I appreciate the opportunity to submit our comments regarding the future of land remote sensing. Our message concerns the benefits of using a new, more reliable technology to help insure continuity in the land observing program and to maintain the United States' leading position in this important area. These objectives are noted in the draft bill of October 26, 1983, and I feel that our MLAID design can meet these objectives on a timely schedule and at a competitive cost. This technology may be utilized on either a government program or by a commercial operator, possibly with certain modifications to reduce both capacity and cost.

In the present Landsat units an oscillating mirror scans an image of the ground scene very rapidly across a relatively few photo sensitive detectors. While these scanners produce useful pictures, their manufacture has become increasingly difficult as we strive to meet demands for higher resolution. Our new approach uses many detectors but has no moving parts while imaging, an attribute that yields long life, high reliability, and improved picture quality. This concept is called multi-linear array or pushbroom technology.

Figure 1 documents Kodak's involvement in earth resources technology for more than a decade. In 1971 we designed for NASA's Goddard Space Flight Center a 3-color, multi-linear array satellite based on our experience in large Maksutov optics. Figure 2 shows a schematic drawing of this instrument. Pictures from this device would have been over 10 times sharper than Landsat views and could have led to a stereo mapping capability. This design was not carried into a flight program; instead NASA chose to pursue the moving-mirror technology in developing the Thematic Mapper instrument. From 1972 to 1976 Kodak provided photographic consultation to Len Jaffe as his NASA office assisted the fledgling earth resources program in several government agencies. By late 1979 difficulties in the Thematic Mapper program caused Tony Calio and others at NASA Headquarters to ask Kodak for a study of alternative configurations based on multi-linear arrays. This work was called AERS, a relatively large but very simple instrument whose design was completed in 1980. Pleased with these concepts, NASA urged the Goddard Space Flight Center to continue these studies competitively. During 1981 and 1982 we defined the MLAID and ELOS instruments - smaller, lighter units than AERS yet capable of fully meeting NASA requirements. However, since June 1982 there have been no NASA initiatives in earth resources as the government evaluated private operation of these facilities.

Our MLAID design, shown in Figure 3, features an unobstructed, reflecting Schmidt telescope. A 3-position stereo mirror and a roll joint give versatile pointing operations while a passive radiator cools the detectors to reduce noise. Our subcontractor, the Westinghouse Electric Corporation, designed a focal plane sensitive to four visible spectral bands and two short wave

infrared bands. The radiator cools the detectors to 125°K without mechanical refrigeration or liquified gases; multi-layer insulation and specially polished and coated surfaces are used in this device. Behind the roll joint a Multi-Mission Spacecraft provides propulsion, electrical power, and command and control functions.

To insure proper registration as the scene moves across the focal plane, NASA required that all six spectral bands cover a span of no more than 20 detectors - about 12-thousandths of an inch. In the Westinghouse array, shown in Figure 4, every visible band has 18,500 detectors, each less than one-thousandth of an inch in size, while the two infrared bands each have over 9,000 detectors that are twice as large. Westinghouse is able to deposit color filters directly on the detectors and can arrange these detectors on a circular arc that matches the best focus of the optics. This capability gives the optics designer more flexibility and leads to a simple 2-mirror system without multiple beamsplitters and cumbersome diverting filters.

NASA's current Landsats always look straight down. The Kodak MLAID design features a stereo mirror positioned to obtain 3-dimensional pictures of the earth that are valuable in the search for oil and minerals. In addition, the roll joint allows views to right or left to avoid clouds or to get next-day coverage of rapidly changing areas. For example, in a pass over Cleveland, MLAID can see from New York City to Chicago. Both roll and stereo mechanisms are well proven designs that are partially described in Figure 5.

The MLAID instrument is not only versatile but also offers sharper images. Figure 6 shows three views of Chicago's O'Hare Airport which compare resolutions of 85, 30, and 10 meters. At left is an actual Landsat picture while the center and right views are aircraft photography adjusted to simulate the image quality from Thematic Mapper and MLAID. The latter shows more cultural details and has better tone descrimination in the pink vegetated areas.

Despite these benefits NASA could not proceed with MLAID development. Restricted earth resources budgets and the shift of Landsat operations to NOAA left only a research and development charter to NASA. Therefore, in 1982 NASA requested studies of ELOS - a unit designed to operate from both the shuttle and in free flight with most of the MLAID characteristics but covering a smaller field of view and using a much smaller radio link to earth. To meet these difficult requirements Kodak decided to present two options. MINELOS just met NASA specifications but offered little growth potential, while MAXELOS was the MLAID instrument equipped with only one third of the full number of detectors yet offering good growth potential.

The schedule in Figure 7 shows that either unit could be completed in about 3 years. The critical elements are the Westinghouse detector array and associated electronics, and an early start was recommended in ordering these components. Incidently, E-Systems Inc. as our subcontractor in the AERS studies for Headquarters had devised an earth resources ground station of high capacity that could easily be produced along with trained operators well within this 3-year schedule, and at a very attractive cost.

From the ELOS work Kodak concluded that the small radio data link severely limited our instrument choices. The conflict between lowest initial cost and good growth was resolved with two designs. While MINELOS meets the minimum goals, MAXELOS offers the best growth plan and long term return on investment. Figure 8 summarizes these findings.

The estimated costs in Figure 9 are for the orbiting instrument without the stabilizing spacecraft, solar panels, data transmitter, or ground station. NASA envisioned first a shuttle captured flight, then retrieval and upgrading with additional detector arrays and an optional thermal infrared system. The total cost for the limited MINELOS missions is about $70 million in 1982 dollars. MAXELOS would first be flown with a very narrow focal plane but with all six color bands. Subsequent additional detectors would finally yield a full capacity system that would meet or exceed the French and Japanese competition in all respects for a total instrument cost of about $120 million.

Again, Mr. Chairman, I greatly appreciate the chance to present this summary of our studies.

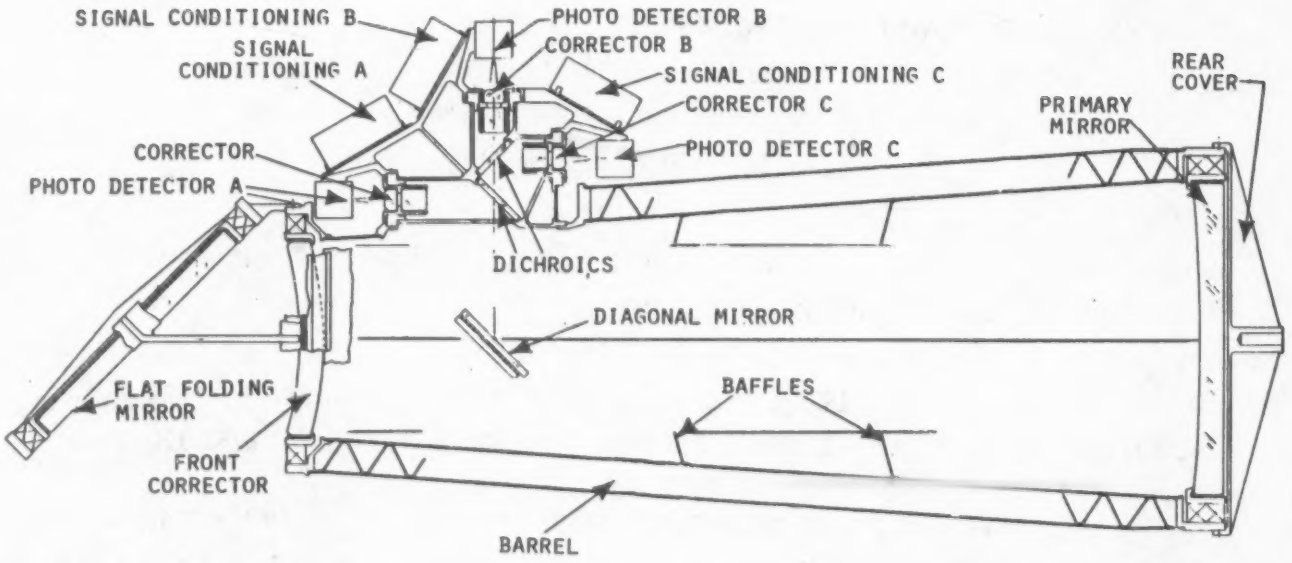
Figure 1 KODAK - NASA EARTH RESOURCES CONTRACTS

JAN - SEPT 1971	$90 (G) MSIS STUDY 72-INCH F.L., 3 COLOR M IFOV
1972 - 1976	$500 (H) L. JAFFE KODAK CONSULT RE: ERTS PHOTO LANDSAT - TM
OCT 1979	HDQTRS - TECHNICAL TRANSFER - CALIO, RANEY, WILLIAMSON
FEB - JUN 1980	$107K (H) DEFINE AERS FLIGHT CONCEPT, 10M IFOV
SEPT - DEC 1980	$133K (H) DEFINE GROUND SEGMENT (E-SYSTEMS) - COST, SCHEDULE
MAY - DEC 1981	$447K (G) MLAID STUDY 10M IFOV 300 MBPS (WEC $140K)
MAR - JUN 1982	$150K (G) ELOS SYSTEM/MISSION STUDY

1307

MSIS	-	MULTISPECTRAL IMAGING SYSTEM
AERS	-	ADVANCED EARTH RESOURCES SATELLITE
MLAID	-	MULTISPECTRAL LINEAR ARRAY INSTRUMENT DEFINITION
ERTS	-	LANDSAT 1, 2, 3 - MULTISPECTRAL SCANNER, RBV (80M IFOV)
TM	-	THEMATIC MAPPER - (30M IFOV) 1982
ELOS	-	EXPERIMENTAL LAND OBSERVING SYSTEM
(G)	-	CONTRACT FROM GODDARD SPACE FLIGHT CENTER
(H)	-	CONTRACT FROM HEADQUARTERS

Figure 2 MULTISPECTRAL IMAGING SYSTEM



BASELINE f/5 MAKSUTOV SYSTEM
1.82 METER FOCAL LENGTH

GSFC - 19 SEPTEMBER 1971
NAS5-21595

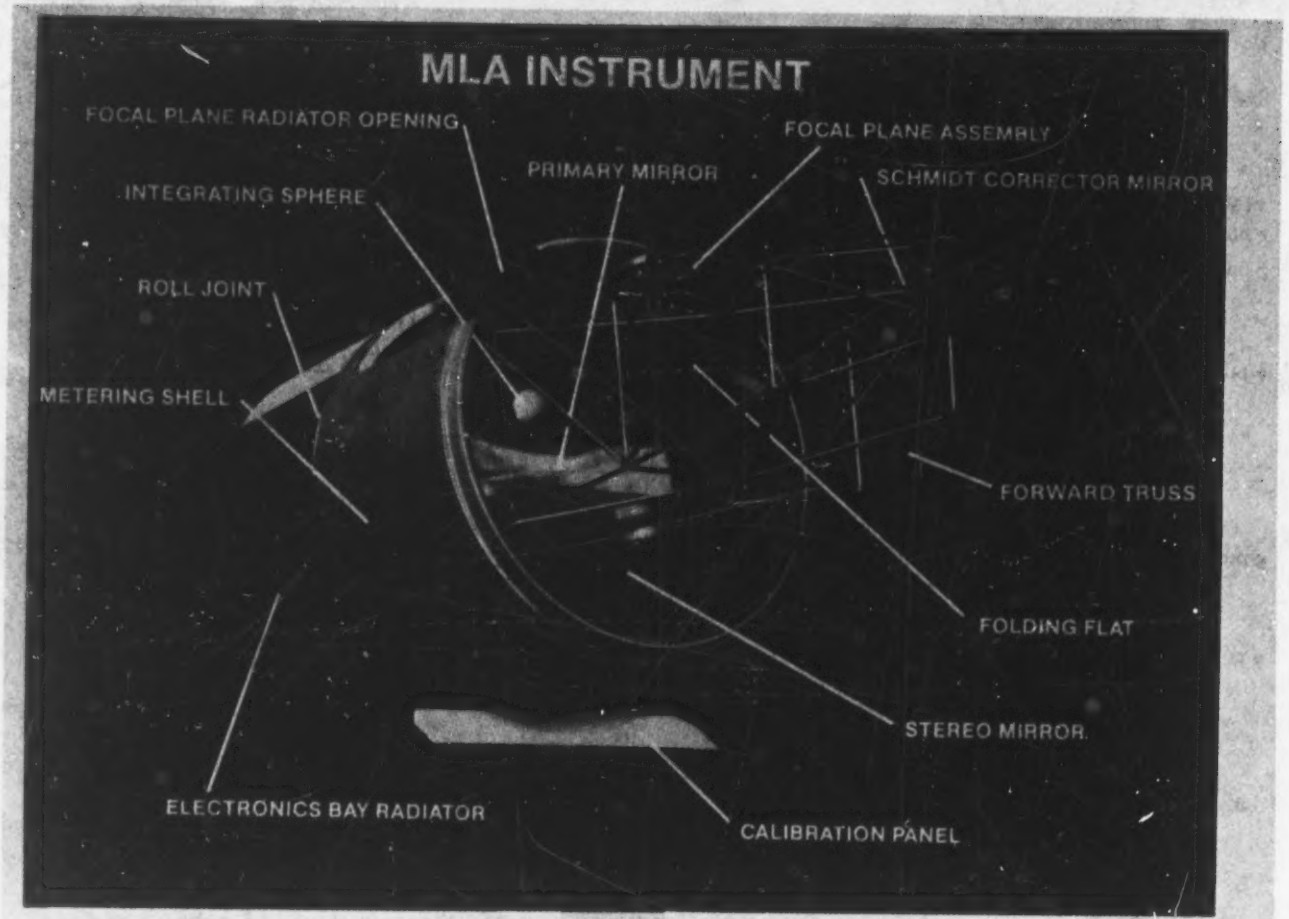

MLA INSTRUMENT
FOCAL PLANE RADIATOR OPENING
FOCAL PLANE ASSEMBLY
PRIMARY MIRROR
SCHMIDT CORRECTOR MIRROR
INTEGRATING SPHERE
ROLL JOINT
METERING SHELL
FORWARD TRUSS
FOLDING FLAT
STEREO MIRROR
ELECTRONICS BAY RADIATOR
CALIBRATION PANEL

FIGURE 3

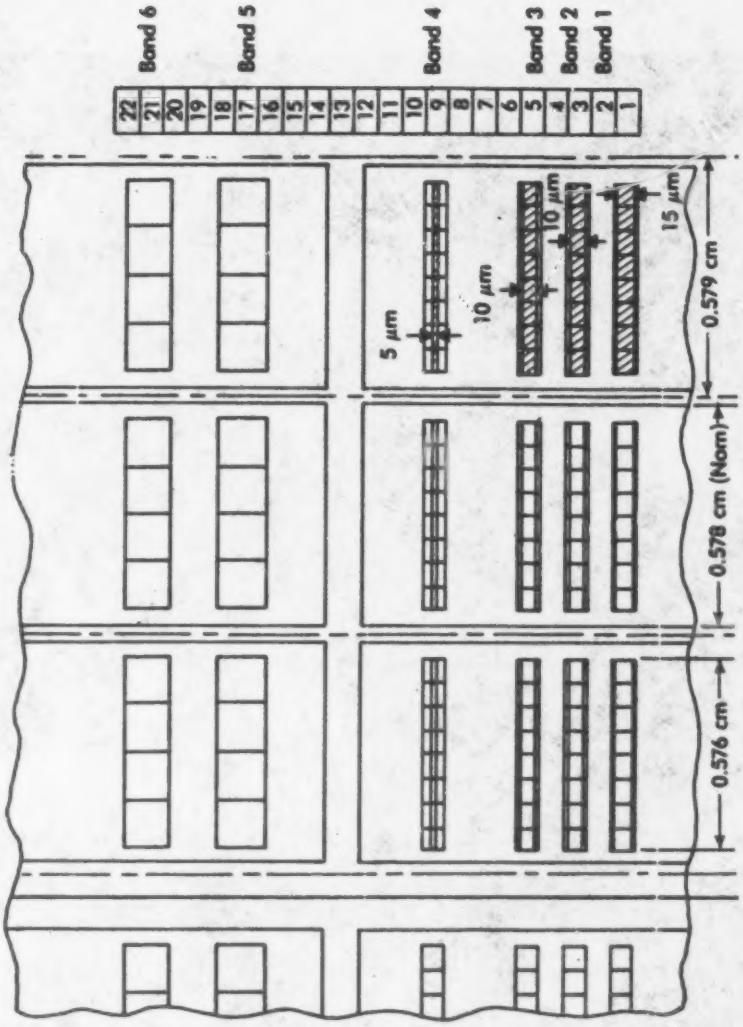
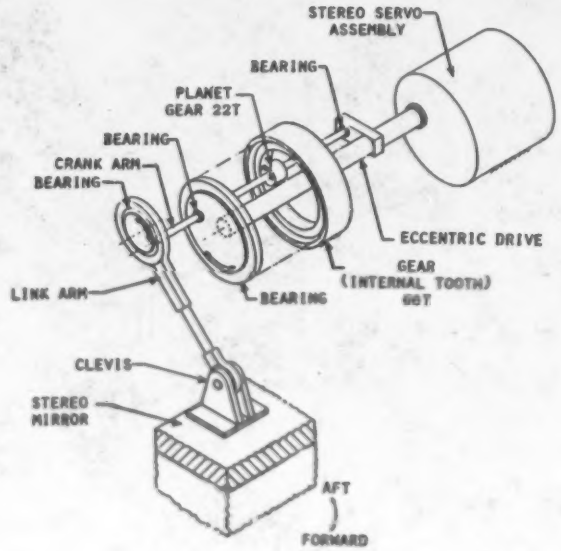
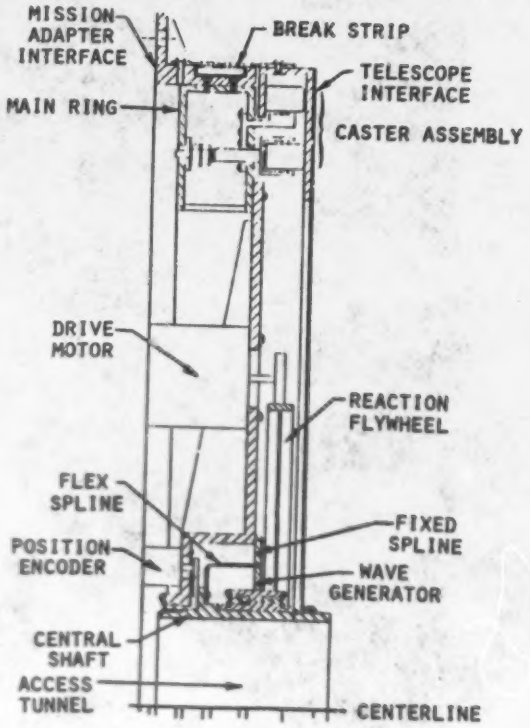


Figure 4 MLA DETECTORS

Figure 5 MLAID STEREO AND ROLL DRIVES



HYPOCYCLOID DRIVE
FOR
STEREO MIRROR



ROLL JOINT

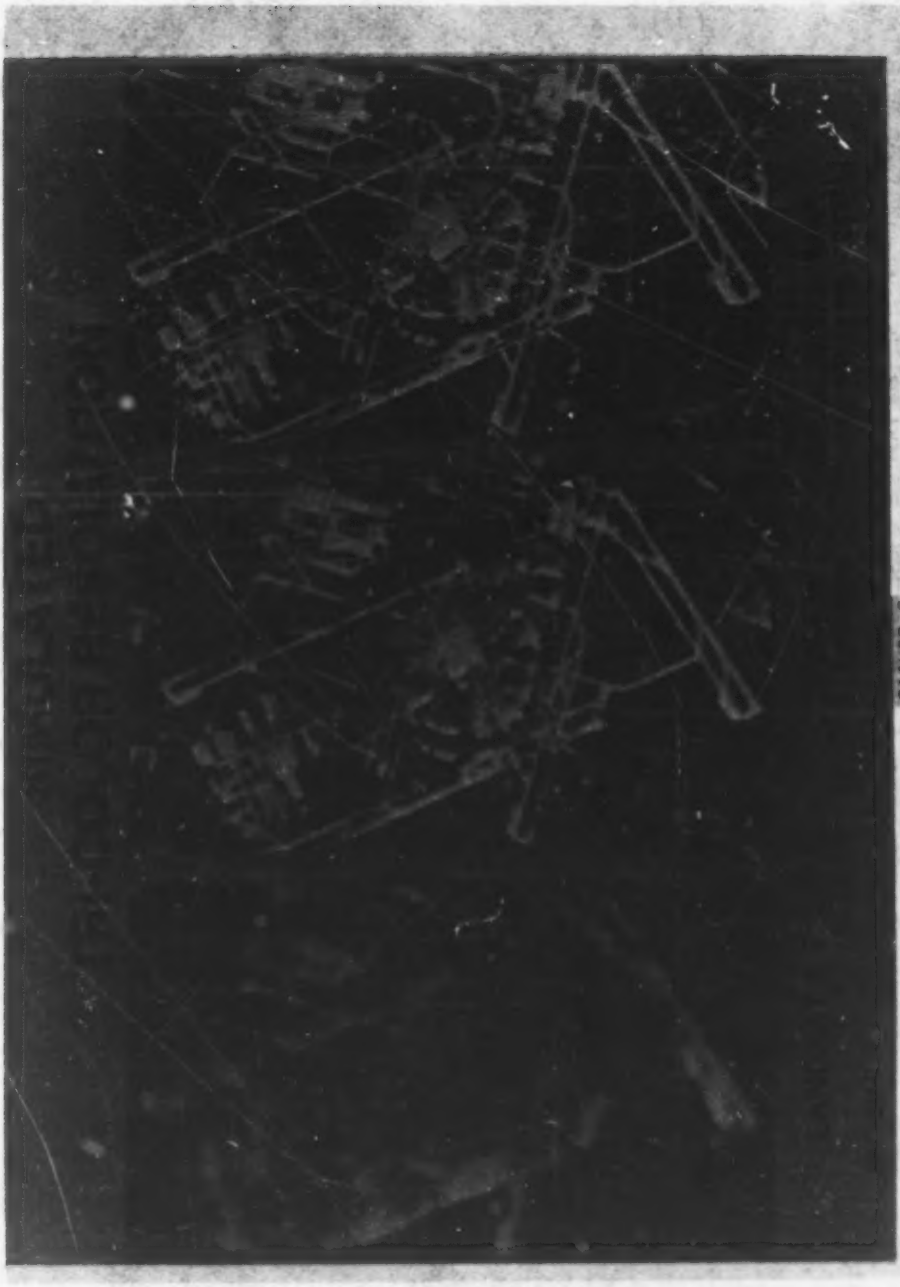


FIGURE 6

Figure 7 ELOS DEVELOPMENT SCHEDULE

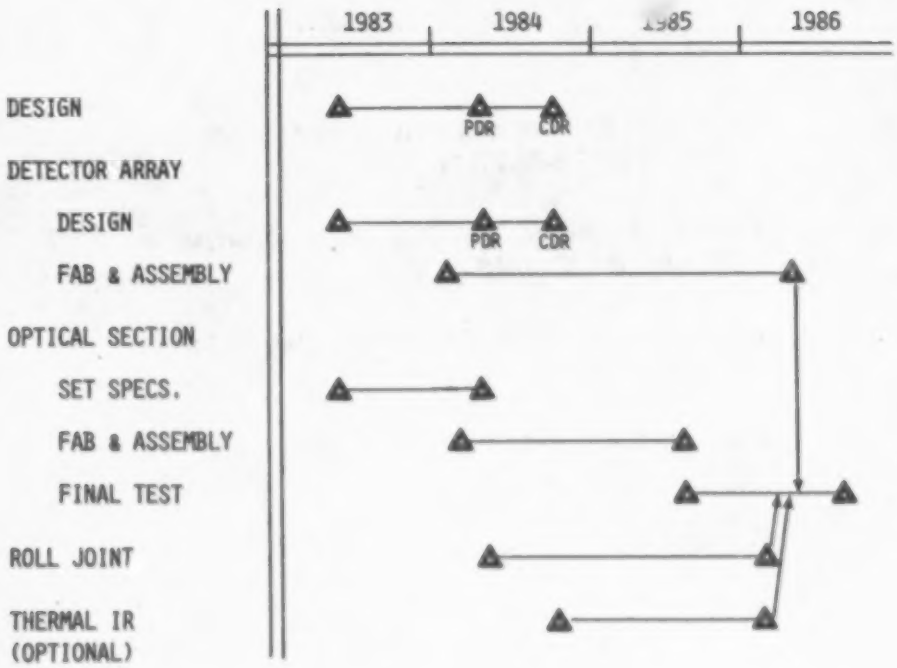


Figure 8 CONCLUSIONS

- DATA LINK OF 48 MBPS SEVERELY LIMITS CHOICE OF INSTRUMENT PARAMETERS
- LOWEST INITIAL COST AND GOOD GROWTH POTENTIAL ARE CONFLICTING GOALS
- MINELOS MEETS ALL OBJECTIVES OVER A 45 KM SWATH AT MINIMUM INITIAL COST
- MAXELOS OFFERS GROWTH AT LOWEST OVERALL COST

Figure 9 ESTIMATED RELATIVE PRICE OF ELOS OPTIONS

MODS = DETECTOR MODULES
TIR = THERMAL INFRARED SYSTEM
BASED ON ESTIMATES IN MILLIONS OF 1982 DOLLARS

SHUTTLE		FREE FLIGHT					
1		2			3		
MINELOS 3 MODS 7.5° $58.9	BANDS 2,3,4 5	MINELOS 4 MODS 10° $4.9	+	MIN TIR $3.4	-----		
MAXELOS 3 MODS 3.75° $90.7	BANDS 1,2,3 4,5,6	MAXELOS 6 MODS 7.5° $10.2	+	MAX TIR $5.2	MAXELOS 12 MODS 15° $11.5	+	MAX TIR ---

DEVELOPMENT SERVICES AND TECHNOLOGY
SERVICES ET TECHNOLOGIE POUR LE DEVELOPPEMENT

SERVICIOS Y TECNOLOGIA PARA EL DESARROLLO
DESENVOLVIMIENTO DE SERVICOS E TECNOLOGIA

THE DESTEK GROUP
1100 CONNECTICUT AVENUE NW
WASHINGTON DC 20036
202/467-5187

November 7, 1983

Dr. Radford Byerly
Committee on Science and Technology
U. S. House of Representatives
Rayburn House Office Building
Room 2321
Washington, D. C. 20515

Dear Rad:

I appreciate being given the opportunity to comment on the draft bill "Land Remote Sensing Commercialization Act of 1983." The state of development within the field of land remote sensing is far enough advanced to attract a significant amount of private capital. What is needed in the way of a catalyst is for the Government to create the proper environment conducive to competitive commercial investment.

The sponsors of this bill should be commended, since its enactment would be a major step in creating this environment. I support all the major points being made and the policies and procedures it defines. There are, however, a few areas that deserve additional consideration.

One of the impediments to commercial investment is the lack of a clear foreign policy regarding remote sensing matters. The Open Skies policy has served the world community well and should be continued. Nevertheless, on a number of occasions, the administration has suggested that it reserve the right to deny countries accesss to remotely sensed data under certain circumstances. These conditions and circumstances should be made clear, so that the business community could assess the degree of business risk associated with such a policy. The Government should also make clear the planned relationships with foreign competitors to the U. S. remote sensing industry, e.g., France, Japan, ESA, U. K., Canada. If the U. S. Government, through such agencies as NASA and NOAA, continues to share R & D results with foreign space agencies, it will be sharing the fruits of U. S. tax dollars with oversea competitors to U. S. businesses.

The second comment I would like to make deals with the stated goal of providing continuity of data. A business enterprise that is embarked upon providing remotely sensed data from space must provide its customers with the data sets they require if it is to have satisfied customers and stay in business. This could mean providing data every month, year in and year out, or the specific data sets over a given period of time. It is neither necessary nor desirable for the Government to require that a contractor must provide for data continuity. The Contractor will meet its customers needs if it desires to stay in business. If the Government places the requirement on a company that it must provide data continuity, the Government is, in fact, stating it will not permit the contractor to fail. A private enterprise cannot be so constrained. If the Government absolutely requires certain data for purposes of national defense, that data should be collected by DoD satallites and be classified.

Since the role of Government is to create the environment necessary for private enterprise to establish businesses, the draft bill goes too far in assigning responsibilities to the Secretary of Commerce. Consequently, the criteria given in Section 203(b) to be employed by the Secretary in selecting a contractor should be reduced, eliminating: "(3) technical competence including the ability to assure continuity of data" and "(4) ability to market aggressively digital remote sensing data." Neither the Secretary of Commerce nor any other Governmental body is in a position to make a proper judgment on these matters.

I hope you find these thoughts to be of some assistance. Nevertheless, it is important that a bill close to the present draft be enacted as soon as possible.

For your information, I am enclosing a brief description of The DESTEK Group, Inc.

Respectfully,

THE DESTEK GROUP, INC.

Pitt G. Thome (KH)

Pitt G. Thome
President and
Chief Executive Officer

PGT:kih
Enclosure

DESTEK GROUP, INC.
WASHINGTON, D. C., USA

THE COMPANY

The DESTEK Group, Inc. (DESTEK) provides governments and private firms with a comprehensive range of quality products and services designed to enable its clients to make optimum use of remotely sensed data, data collected by earth-observing spacecraft and aircraft. This data, when combined with computer-assisted processing and analysis, can be converted to unique information that is not currently available for management and development of natural resources and the protection of the environment.

DESTEK's principal line of business is that of assisting customers to become skilled users of this data, by helping them acquire a completely independent ability to employ remotely sensed data in their information systems. This encompasses all of the steps necessary to train and equip a customer to be able to independently conduct his own analysis and apply the results. DESTEK accomplishes this by helping the customer define his precise information and data needs, by designing the system, and training the customer's own staff to be able to process the data into the form which the customer-defined applications require. DESTEK also maintains a continuing relationship with its clients to assist them with the application of the analyzed data, and to upgade the system as new, more effective data analysis techniques and related software and hardware become available.

Another of the Company's main lines of business involves supplying specialized data products and related software, tailored to customers' requirements. This sector of the Company's business includes the acquisition and sale of both unprocessed data and specialized products, where the unprocessed data has been transformed into specific kinds of data and datasets designed to meet the customers' needs. DESTEK uses data collected by both the current generation of orbiting sensor platforms, and those which will be orbited in the future by countries such as the U. S., France, Japan, and West Germany. The Company will also deploy specific sensor systems on the Space Shuttle to meet specialized and proprietary data needs of its clients in a cost-effective manner.

The company also performs complete analysis of the remotely sensed data for customers who do not desire to obtain their own data analysis capabilities.

PRODUCT AND SERVICE SUMMARY

DESTEK furnishes the following products and related services:

* Data Analysis System Design, Installation and Integration

  Each installation is custom designed, and its products are integrated into the client's information system. The scope of effort includes requirements definition; design, integration, test and installation of the analysis system; training of the customer's applications and systems operation and maintenance personnel; and system upgrading as new analysis techniques and related software and hardware become available.

* Specialized Data Products

  These include computer compatible tapes (CCTs) containing data from one or more sensor systems, which have been enhanced or merged to form a specific data set. DESTEK will also acquire data from sensors flown on aircraft and the Space Shuttle and convert the data to CCTs to meet specialized and proprietary data needs of its clients.

GROUP EXPERTISE

1. DATA/IMAGE ANALYSIS SYSTEMS - DESIGN AND INTEGRATION

   Hardware/Software
   Training
   Upgrading

2. DATA ACQUISITION

   Satellite Systems (LANDSAT, NOAA, SPOT, etc.)
   Aircraft Instruments (Scanners, Mapping Cameras)
   Space Shuttle Instruments (SAR, Mapping Cameras, Spectrometers)

3. SPECIALIZED DATA PROCESSING

   LANDSAT MSS & TM Data
   NOAA/AVHRR Data
   SEASAT, SIR-A, SIR-B Data
   Thermal Infrared Data
   Special-purpose Datasets

4. AGRICULTURAL RESOURCE ASSESSMENT AND MANAGEMENT

Crop Inventories/Statistics
Crop Conditioning/Production Monitoring
Erosion Hazard Assessment
Soils/Land Suitability

5. ENVIRONMENTAL PROTECTION

Impact Analysis (Acid Precipitation, Surface Mining, etc.)
Change Detection (Deforestation, Desertification, etc.)
Ecosystem/Habitat Studies (Wildlife, Fisheries, Insect Pests, etc.)

6. FOREST AND RANGE ASSESSMENT AND MANAGEMENT

Timber Stand Inventory and Monitoring
Stand Condition Assessment

7. GEO-EXPLORATION

Geobotanical Analysis
Thematic Analysis
Special-purpose Image Enhancement and Datasets

8. HYDROLOGY

Watershed/Riverbasin Resource Assessment
Flood Damage and Flood Plain Analysis
Irrigation Monitoring

9. LAND USE PLANNING

Mapping and Map Update
Urban Expansion/Resettlement Studies
Routing and Siting of Major Infrastructure
Regional Analysis
Geographic Information Systems

PRESIDENT AND CHIEF EXECUTIVE OFFICER, PITT G. THOME.
An internationally recognized leader in satellite remote sensing. For the last thirteen years, Mr. Thome managed NASA's remote sensing programs, including LANDSAT, meteorological satellites, advanced sensor developments and the research activities related to information extraction techniques for both renewable and non-renewable resources. He led the

effort to develop applications for this new space capability in the field of agricultural production forecasting, mineral and petroleum exploration, water resources management, and land use planning and development. As Director of Resource Observation Programs, he managed contracts totalling approximately $130,000,000 per year and 1500 NASA employees. As a result of his leadership, the United States is the world leader in this new and important space capability. In the course of discharging his responsibilities, Mr. Thome worked extensively with Federal Government agencies, State and private organizations and with organizations in South and Central America, Europe, Japan, Southeast Asia, Africa and Australia. He is a member of the American Institute of Aeronautics and Astronautics (AIAA) and the American Astronautical Society (AAS), and has been recognized for his achievements by NASA, the National Space Club, and Sigma XI. He holds B.S. and M.S. Degrees in Aeronautical Engineering from the University of Notre Dame and MIT respectively, an M.B.A. from Xavier University, and attended the Harvard Business School's Advanced Management Program.

Company Contact

Pitt G. Thome
President and Chief Executive Officer
THE DESTEK GROUP, INC.
1100 Connecticut Avenue, N.W.
Washington, D. C. 20036
Telephone: 202/467-5187

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20500

December 6, 1983

Dear Dr. Byerly:

Dr. Keyworth has asked me to respond to your request for comments on the draft bill, "Land Remote-Sensing Commercialization Act of 1983." The Administration is very anxious to turn heretofore government activities such as remote sensing information systems over to the private sector. Our national research programs have already demonstrated the value of remote-sensing applications. It is now the government's role to expedite the transfer of this technology to the private sector and insure that regulatory hindrances to growth are minimized. Several initiatives in progress, including this draft legislation, are clearing the way for such a change.

Another initiative, the Commerce Department's RFP for the Landsat system, will also advance this process. As my first comment concerning the Subcommittee's draft, I believe it would be most beneficial for Congress to postpone action on this bill until after the proposals from bidders are received by Commerce in March 1984 and reviewed. I realize that several aspects of the RFP differ from the language of the bill, but I believe proceeding now with the Commerce Department's commercialization plan is the proper course.

My only comment concerning the specifics of the bill relate to government purchases of data. I believe it should be clearly stated that there will be no guarantees of purchases from any of the federal agencies. Surely some agencies will acquire some for their research and monitoring functions, but a contractor must assume the business risk of no guaranteed minimum sale.

I hope these thoughts have been of help. Please call me (395-4823) if you have any questions.

Sincerely,

Richard G. Johnson
Assistant Director

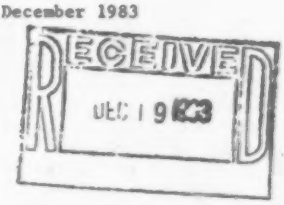
Dr. Radford Byerly, Jr.
Subcommittee on Space Science
and applications
Suite 2321 Rayburn Building
Washington, D.C. 20515

NATIONAL RESEARCH COUNCIL
COMMISSION ON PHYSICAL SCIENCES, MATHEMATICS, AND RESOURCES
2101 Constitution Avenue Washington, D.C. 20418

SPACE SCIENCE BOARD

OFFICE LOCATION:
JOSEPH HENRY BUILDING
21ST STREET AND
PENNSYLVANIA AVENUE, N.W.

14 December 1983



Mr. Raymond Kammer
Chairman, Civil Remote Sensing System
NBOC1
Suite 300
11420 Rockville Pike
Rockville, Maryland 20852

Dear Mr. Kammer:

The Committee on Earth Sciences (CES) appreciates the Source Evaluation Board (SEB) presentations to us on June 8 and September 6 concerning the commercialization of the operational LANDSAT and meteorological satellites (Metsats). In the last two decades, the use of the operational weather satellites to observe the workings of the atmosphere has become a central element of research in the atmospheric sciences. Similarly, the LANDSAT data have been of considerable use to the geological sciences and have the potential of providing much needed information in the biological sciences.

The Committee is aware of the recently enacted legislation which prohibits the LANDSAT/Metsats commercialization. However, we are also aware that this decision is only a part of the overall issue of space commercialization which will continue to be the focus of discussion and debate. We therefore regard it as both timely and appropriate to provide you with our views as scientists on this very important issue and thank you for the opportunity to do so.

The CES is naturally concerned about the impact of commercialization on current and future research that requires the Metsat and LANDSAT data. At the present time, the scientific and research community is involved in the U.S. earth remote sensing program in at least two important ways. First, as already noted, the data returned from LANDSAT and the Metsats (and from other potential operational satellite systems) are of considerable importance for basic research in geology, geophysics, biology, oceanography, meteorology, and hydrology. The further development of these sciences will be seriously affected if access to space data is restricted. The results of this scientific inquiry are of immense benefit to mankind in providing a better understanding of how the Earth's surface evolved and its resources were formed, of how weather and climate operate, how to realize accurate predictions, and how the global ecosystem functions. Second, the direct involvement of scientists in the operational space program results in the development of new techniques and technologies which become the basis of future operational sensor systems. For example, the infrared bands on the Thematic Mapper on LANDSAT D are the result of scientific input in the early to mid- 1970's and have resulted in by far the most useful space data to date for land remote sensing.

In our opinion, the major scientific issues associated with commercialization are: (1) the degree to which the scientific community will be involved in the transfer of this national resource to the private sector and its operation thereafter; (2) the extent to which the satellite systems and the resulting data will be readily available for research; and (3) the level of government-sponsored basic research which will be retained and developed to take advantage of the unique data base provided by these satellites and to foster future advances in sensor technology..

We assume there is a serious intent to preserve the scientific resource and value inherent in the evolution and use of these systems. Thus, in our judgement, involvement of the scientific community in the transfer and operation of a system should extend to participation in reviewing proposals from potential commercial groups, membership on oversight and planning bodies, and consultation on the design and operation of these satellites and their data handling systems. Further, there should be: easy, low-cost access to data in a usuable form for research; freedom to publish analyses of these data in scientific journals without hindrance to scientific inquiry; reasonable input into the sensor design and use in operational systems to prevent unnecessary loss of scientific value; and opportunities to fly experimental sensors on commercial satellites. In addition, it seems unlikely in the near term that commercial interests will undertake the research program that is vital to the improvement and growth of the operational capabilities. In such a case, the research and data analysis program should be retained and sponsored by the government. Such a research program should be concerned with satellite data for all relevant earth sciences, should identify new measurements, techniques and technologies to improve sensor systems, and should develop and fly experimental instruments on operational satellites.

Finally, we note that the scientific community is not opposed to commercialization of operational systems in principle. We recognize that many earth science investigations lead to practical applications. Whether these applications are realized in an operational system under government or private management is not a scientific question. Our concern is the extent to which the operational system is closed or restricted to the scientific community, thereby severely reducing its use for scientific research and, equally, inhibiting the flow of new scientific knowledge and instruments toward improving operational systems.

We will be pleased to comment further if you have additional questions. We hope you will continue to keep us apprised of new developments from the SEB.

Sincerely,

Ronald G. Prinn
Chairman, Committee on Earth Sciences

COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, D.C. 20515

MEMORANDUM

January 31, 1984

TO: Members and Staff

FROM: Larry Winn

SUBJ: Visit to Superior Oil
Houston, Texas

As a follow-up of the visit to Bechtel in early December, I visited Superior Oil in Houston, Texas, later that month, to learn more about how remote sensing data is used in explorations for non-renewable resources. Jon Davidson, who is manager of Superior Oil's Exploration Operations, described how Landsat data is used both in exploration for oil and for hard minerals such as copper, gold, silver, or other precious metals. He explained that Landsat data is simply one of various tools used in geologic analysis, but the use of Landsat data can save them millions of dollars. This is especially useful in those locations of the world where there were no previous ground studies. There is a saving in both time and money, compared to using ground teams. A Landsat scene covering 12,000 square miles can be purchased for about $200. There is a great deal of trading tapes of digital Landsat data among the private sector. If Landsat was commercialized, these tapes would have copyrights, and there would be less tape trading.

Jon Davidson was particularly excited about the funding commitment for Landsat D' and the news that D' will be launched this March. The malfunction of the thematic mapper on the present Landsat D satellite was a disappointment to the mineral exploration people since the thematic mapper provides data that is of particular interest to the geologic community. Jon Davidson said the original Landsat, using the multi spectral scanner (MSS), was designed for agricultural interest. At the insistence of the Geosat Committee, two new bands of particular interest to geologists (1.6 and 2.2 microns) were included in the thematic mapper. These two bands allow geologists to do surface geochemistry including petroleum exploration work. He pointed out that six more bands would allow geologists to actually identify the type of rock as opposed to the present capability of only being able to tell when the rocks are of different types. He was concerned that the present effort at commercialization is focusing on MSS technology, and that private industry would be reluctant to do the long payoff research and development desired by geologists. He pointed out that if Landsat data was not provided by commercial firms or the federal government, the oil companies would not provide their own satellites. He is concerned that the U.S. could soon be out of the remote sensing business, that the U.S. firms might not be able to buy data from the foreign firms, and that foreign firms would favor firms in their home country as customers.

In regard to the issue of Open Skies, he feels the French and Japanese only adopted the Open Skies position because they were forced to by the U.S. position. Failure of the U.S. to maintain a role in remote sensing could mean the end of the Open Skies policy. He added that the concepts of aging data or an exclusive period are routine in industry and should be considered as consistent with Open Skies.

LW/Fmb

The Geosat Committee, Inc.

Jan. 10, 1984

The Honorable Harold L. Volkmer
Chairman, Subcommittee on Space Science
and Applications
US HOUSE OF REPRESENTATIVES
2324 RHOB
Washington DC 20515

Dear Mr. Volkmer:

Enclosed are some corrections to the transcription of my testimony before your subcommittee on Nov. 7, 1983. I hope we are not too late with them. I would appreciate your incorporating them into the final testimony.

I am grateful to have had the opportunity to give my testimony on the geological applications of civil satellite remote sensing.

Respectfully yours,

Frederick B. Henderson III, Ph.D.
President

153 Kearny Street, Suite 209
San Francisco, California 94108
(415) 981-6263
Telex: 910-372-2043 GEOSAT SFO

Frederick B. Henderson III, Ph.D.

Land Remote Sensing Legislation
Tuesday, Nov. 7, 1983

TESTIMONY BEFORE THE HOUSE SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT and SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS, COMMITTEE ON SCIENCE AND TECHNOLOGY

Corrections to transcription:

Line

421 et al — Our next two witnesses are Dr. Frederick B. Henderson III, The Geosat Committee, and on the same panel, Mr. Donn Walklet
ORIGINAL: Our next two witnesses are Dr. Frederick Henderson, GBOSAT

428 et al — The Geosat Committee
ORIGINAL: GBOSAT Committee

469 — chance to finish everything I wanted before this hearing
ORIGINAL: hearings

471 — week on Friday and discussed a number of the applications and a
ORIGINAL: week on Friday and discussed a number of the applications -- a

476 — satellite Advisory Committee (CORSSAC), chaired by Michel
ORIGINAL: satellite Advisory Committee (CORSSAC), cahired by Michele

503 — LANDSAT program will not suffer because of the decisions
ORIGINAL: LANDSAT program will not suffer because of this--decisions

511 — We do not agree with the inference in your
ORIGINAL: We do not agree with the base--with the inference in your

516 et al — with respect to the Thematic Mapper (TM). The basic MSS data can
with respect to the thematic mapper. The basic MSS data can

524 — D' to replace the unfortunately failing LANDSAT-4
ORIGINAL: D' to replace the unfortunately failing--or ailing LANDSAT 4.

530 — Request for Proposal (RFP). This three-year data gap, were it to exist,
531 ORIGINAL: This three-year data cap--or gap, were it to exist

[539 et al - Should be typed Landsat/TM program. The program itself is typed in lower case; Landsat; specific satellites are upper case - LANDSAT-4/TM, LANDSAT-5/TM, etc.]

543 — commercial system can provide the data we require.
ORIGINAL: commercial system can provide the date we require

546 — must revitalize and commit to a continuing high-risk
ORIGINAL: must revitalize and commit to a continued high-risk

556 — sector R&D will not lead to new commercial systems
557 ORIGINAL: sector R&D is simply not commercial and is not leading towards new systems

[560 et al - "Open Skies" policy; 'Open' and 'Skies' should be capitalized and the phrase, "Open Skies" put in quotation marks]

589 position that the value-added industry is better
ORIGINAL: position that the land--value-added industry is better

[630 et al LANDSAT-4/Thematic Mapper, rather than 'LANDSAT 4 thematic mapper']

633 Unfortunately, we went into that 18 month period, which is shown
ORIGINAL: Unfortunately, we went into that 18 period, which is shown

677 concentrate, instead of the multispectral scanner
ORIGINAL: concentrate, instead of the multi-sprectum

684 LANDSAT-1,-2,-3 MSS data and LANDSAT/Thematic Mapper data are
685 like Ford T and A models; there are many, many more better
ORIGINAL:LANDSAT 1, 2, 3, MSS data and LANDSAT thematic mapper data, like Ford T and A models; they're are many many more better

690 to play an important role in that R&D.
ORIGINAL: to play an int role in that R&D.

727 for three years under the last Administration on the thing
for three years and the last Administration on the thing

734 served and who ought to pay caused us to lose that
ORIGINAL: served and who ought to be paid caused us to lose that

735 battle. It was never built, so we will buy from the French.
ORIGINAL: battle. It was never built, so we will add from the French.

736 They are building a SPOT stereoscopic system and will fly it in another
ORIGINAL: We're going to build a SPOT system and fly it in another

964 see no reason why.....
ORIGINAL: seen no reason why.....

965 that require proprietary
ORIGINAL: that copyright and proprietary--which require proprietary

970 word, I think, rather than "exclusive".
ORIGINAL: work, I think, rather than "exclusive."

986 aquiring system
ORIGINAL: requiring system.

1018 these systems and.....
ORIGINAL: these syms, and.....

1033 the sense that it is a.....
ORIGINAL: the sense the--it is a.....

1034 continue to be a subsidized system in one form or another. We believe
1035 it'll
ORIGINAL: continue to be a subsidized system one form or another. We hope that it certainly--we believe it'll.....

1252 that. I just feel that we must have this technology.
ORIGINAL: I just feel that we have this technology.

1256 government commitment to continue the land
1257 ORIGINAL: government commitment to continue in the value of the land

1263 stumbling around trying to figure out how or maybe push it too
ORIGINAL: stumbling around trying to figure out or maybe push it too

1279 that hands out Landsat data to school children and
ORIGINAL: that handles--hands out LANDSAT data to school children and

1286 value-added industry who can deal with various different user
1287 levels and varying degrees of sophistication
ORIGINAL: value-added industry who can deal with various different levels and various different sophistication of users.

1306 the U.S. Government and asked for a joint venture to fly or
ORIGINAL: the U.S. Government and asked for a joint venture to fly by

1588 there is military influence over the development of civil remote
1989 sensing and that it will probably continue in this country.
ORIGINAL: there--that the military control of the development of remote-sensing exists and will probably continue in this country.

1597 data, for example, from the radar altimeter, SEASAT, eventual
ORIGINAL: data, for example, from the radar altimeter, C-SAT, eventual

1598 U.S. Navy classified follow-on to that program.....
ORIGINAL: follow-on to that program.....

1600 to the private sector geologist because it has inherently
ORIGINAL: to the private sector biologist because.....

1714 Geosat Committee was formed in 1976 as a
ORIGINAL: GEOSAT was committeed--committee was formed in 1976 as a

1932 enterprise system, we may not get your best answers
ORIGINAL: enterprise system, that's where you'll get your best answers

2220 one good global data set. If all ground receiving stations
ORIGINAL: one good global data set. If all grant-receiving stations

2222 to fly it for three or four years.....
ORIGINAL: to gly t for three or four years.....

2228 which was originally accepted by the Reagan
ORIGINAL: which the original--was originally accepted by the Reagan

2231 If the private sector can come up and.....
ORIGINAL: If the private can come up and.....

Additional Questions and Answers
Submitted by

Donal K. "Deke" Slayton, President
Space Services, Inc.

Hearings on Land Remote-Sensing Commercialization Legislation

Questions for All Witnesses

1. The bill was drafted to reflect the following principles ("a" through "j") which summarize the lessons drawn from several previous hearings. Do you think these are valid and useful principles? Do you think the bill reflects these principles? Do you have any specific comments on individual items? (Note that there are some related questions below.)
   a. If we really want to commercialize, we should let the private sector make most of the critical decisions -- we should give them a clear framework in which to operate. For example, we should not dictate technology.

   b. We have had much testimony that data continuity is very important, and in particular that the lack of continuity has adversely affected the market for Landsat data.

   c. A truly commercial system will be driven by user needs -- which may or may not require state-of-the-art technology.

   d. In the beginning, some government subsidy may be needed, but we should encourage the private sector to compete to see how small the subsidy can be.

   e. Phased commercialization starting with the ground segment -- i.e., marketing -- is the most promising approach. Since the existing Landsat system is virtually all in place, its operation is not challenging, but marketing the data it generates is a challenge and perhaps an opportunity.

   f. Both "open skies" (i.e., non-discriminatory access to data) and considerate treatment of foreign ground stations are important U.S. foreign policy concerns. The "open skies" policy should be maintained.

   g. Continuity of competition is important. One-time competition at the time of a contract award is not sufficient.

   h. The value-added business is healthy, commercial, and entrepreneurial. It is the principal stimulus for potential market demand. We should not let anti-competitive practices affect this industry.

   i. Weather satellites perform an inherently governmental function and should not be commercialized.

   j. The Federal Government should continue research in satellite remote sensing.

2. The bill expressly places the responsibility on all operators to sell data on a non-discriminatory basis (i.e., equal availability and equal price for the same services to all comers). In this the bill would maintain the current U.S. policy of "open skies".

   a. Can a healthy market be developed within such a policy framework?

   b. Is such a policy socially and economically just?

   c. Is there any feasible alternative that could preserve our current international policy?

   d. Are there foreign policy benefits to the U.S. from maintaining this policy?

   e. Under private sector operation, should there be public disclosure of the names of those purchasing data and the scenes that they have purchased?

   f. Should a listing of all available scenes be published by the operator? How promptly should this listing be published?

3. Some of the problems that the SEB has had in writing the RFP have been related to national security.

   a. One problem is that any system operator may be required to have certain excess capacities or standby capabilities to meet national security requirements. Who should pay for any extra costs of such requirements? Should civilian users pay? Should the Department of Commerce pay? What is your view of Sec. 608 (c) of the bill, which authorizes the Secretary of Commerce to require agencies to reimburse a licensee on the basis of such requirements?

   b. If DOD (for example) were to have a strict requirement for a highly reliable and continuously available (if not continuously utilized) capability, should this capability be maintained as part of a commercial system or should it be pulled out of the commercial system and operated totally as a DOD system?

   c. Assume the following case: A private operator receives a federal license under Title IV to launch a particular sensor. A year later, the license is revoked because the government has become aware of potential applications of the sensor which could compromise national security. Should legislation explicitly foresee this type of situation? If so, what remedies for the operator would you suggest, if any, to compensate him for lost revenues?

4. The draft bill (in Sections 202 and 303) treats any product beyond the raw data as a "value-added" product which can be sold by the operator only with certain restrictions.

   a. Are existing anti-trust laws sufficient to offer protection to the value-added entrepreneur?

   b. Do any additional steps need to be taken to stimulate the value-added industry?

5. Under this bill, the operator of the future system under Title III could very well be different than the operator of the present system under Title II.

   a. Does the Title II operator have sufficient motivation to be aggressive about expanding the market for data sales? Or would he basically serve as caretaker of the current system?

   b. Are the provisions of the bill sufficient to build up a market under Title II that will be of benefit to the operator under Title III? (i.e., does the clear separation between these two operators enhance the competition and diversity of the industry as we intended?)

   c. Where do you think the market will be for the Title II operator? For "MSS" (Multi-Spectral Scanner) data? For "TM" (Thematic Mapper) data? How about for the Title III operator?

   d. Title III posits a period of six years of government support after which industry will presumably be able to determine whether land remote-sensing is a viable commercial enterprise. Is six years (after the demise of Landsat 5) sufficient time to make an assessment about the feasibility of private land remote-sensing ventures?

6. The draft bill represents an honest attempt to commercialize land remote-sensing as rapidly as possible with minimal government subsidy. As such, it offers no special protection for States, for Federal agencies purchasing data, for university researchers, or for current and future foreign users. Should the bill contain provisions to protect or subsidize such users?

7. The bill, in Title III, provides for at least six years of data continuity for MSS data. Advanced technologies may be employed at the operator's expense.

   a. Should data continuity linked to past and present needs remain the goal of this bill? If so, is the approach outlined in Title III a useful means of guaranteeing such continuity? If not, what is the government's minimum responsibility?

   b. Is it appropriate that the private sector make the high risk decisions necessary to implement advanced technologies? If not the private sector, then who?

c. Is there any reasonable way for the government to ascertain in advance the market for advanced technology?

d. Is it reasonable to assume that the use of advanced technologies should and will be user-driven? Should the government, through legislation, push specific technologies on users?

e. Is the six-year period specified in the bill sufficient to allow present users to amortize the investments already made in equipment and training?

8. In Title II, the bill effectively terminates government involvement in satellite hardware with Landsat D'.

a. How old is this technology, i.e., when was Landsat D' designed? Have there been advances since then?

b. Is there any compelling need to continue production of the Landsat D series? Would it not be more efficient to produce newer technology?

c. Can the private sector react efficiently to prevent or minimize a data gap after the demise of D'?

9. The bill in Sec. 403 (b) encourages Federal agencies to enter into consortium-like relationships with the private sector.

a. Are there any potential conflicts-of-interest in such a plan?

b. Could such a consortium help to serve the individual needs of various Federal agencies? Could it enhance the viability of remote-sensing industry?

10. Does the United States have any obligations to the countries that have invested several million dollars in their Landsat receiving stations?

11. How should the government treat any private sector plans to begin ocean remote sensing?

12. Should any private operator of a remote-sensing system be required to maintain a data archive?

Majority Questions

1. We agree with the principles outlined. Our testimony adequately addresses the specific items listed in question #1. However, regarding item h, we have submitted specific comments on the bill language dealing with "anti-competitive practices" affecting the value-added industry. We do not believe it is necessary for the contractor to set up "an organizationally separate unit" if it decides to get involved in the "value added" business. A separate cost center and the implementation of Sec. 202(b)(2) and (3) will adequately protect the value-added industry from unfair practices.

2. Our testimony adequately addresses the specific items listed in question #2a through 2d. With respect to 2e, we believe that the existing practice should be continued under which the names of individual customers are not released unless specific permission is given. This is a normal commercial practice. With respect to 2f, we believe that the prompt provision of such a listing would serve a useful marketing function, but cannot comment yet on its precise timing.

3. a. The government. No. Only if they mandate changes. We support the language in Sec. 608(c) but would require that the Secretary be mandated to have costs reimbursed by the agency in question, rather than leaving it up to the Secretary's discretion.

   b. We believe that DOD requirements should be dealt with on a case by case basis. We would like the opportunity to serve DOD markets from our civil system and believe these markets will be important components of the overall land remote sensing market.

   c. Yes. Uncertainties surrounding governmental policy on land remote sensing satellite commercialization need to be resolved before private sector operations can be successful. Limits on sensor bands and resolution should be identified before companies invest in system design and construction. Otherwise, we believe that the investment risk would be too great to attract private monies. If it is impossible to set limits up front, then the legislation should require the government to compensate the company for all monies expended and legally required to be expended under its contracts, and for loss of revenues, thereby allaying the concerns of investors.

4. a. Yes.

   b. No.

5. a. and b. We believe that the Landsat RFP is taking the correct approach in combining the Title II and III procurements: As a practical matter, with Landsat D' being launched in early March, 1984, with a projected useful life of three years, Title II contracts will in all likelihood be of short duration. The contractor selected for even this short period will have a major incentive to market data aggressively since this will increase the market for data from his Title III system.

   c. We believe that there will be an expanding market for MSS-type data for agricultural and other monitoring functions, particularly as data delivery times are shortened. In addition, there will be a strong market for TM data in the geological, mapping, and other user communities interested in using the information content in the new bands and exploring the advantages, if any, of higher resolution data. Our Title III market projections are proprietary.

   d. We are concerned that Title III provides for a six year contract, whereas the Landsat RFP provides for a contract of up to twelve years. We favor the Landsat RFP since it gives bidders greater flexibility in their approach to the commercialization process. This is desirable because it is difficult to predict with certainty the precise moment at which a land remote sensing system will become commercially viable.

6. No. These markets are major components of the overall land remote sensing market. Commercial operators will necessarily be interested in serving these customers aggressively. Protections or subsidies for any of these groups will immediately distort the natural interplay of market forces and will preclude the commercialization that is the basic goal of the legislation.

7. a. Yes. Our testimony addresses this point. We would reiterate our understanding that our program meets the requirements of the bill by providing 80 meter data in the visible portion of the spectrum, even though the bands themselves are not all identical with the MSS bands.

   b. Yes, unless the implementation of advanced technology is required by a government agency. In which case, see our answer to question 3a.

   c. The government can and should continue to develop advanced remote sensing technologies. To some extent, the government can ascertain in advance the market demand for new remote sensing technologies by seeking industry's analysis as to which new systems might prove most marketable. Industrial advice, at a very early stage, could be one useful means for gauging which technology development efforts should be purely private, which should be solely governmental, and which systems might best be developed through joint government/industry efforts.

d. Yes. No; the market should dictate the technologies to be used.

e. See answer to question 5d.

8. a. The MSS was first flown in 1972, using state-of-the-art technology of about 5 years earlier, or 1967. The TM contract was let in 1977, reflecting current technology at that time. Both sensors use mechanical scanning techniques. New, solid state, linear arrays have now been developed so that less expensive pushbroom scanning technologies can be used in the visible portion of the spectrum. Additional solid state arrays being developed for the short-wave infrared portion of the spectrum will become available in 1984, with arrays for the thermal portion of the spectrum being available sometime later.

b. No. Yes.

c. Yes. Our system, as planned, takes two years to build, once we obtain FCC approvals and funding. If we are selected as the Title III contractor, we could be ready for launch in 1986. Landsat D' has a design life of three years and is scheduled for launch in 1984, so we could serve the role of a "gap filler" satellite.

9. a. Yes. What if Commerce, the proposed regulator under the draft bill, were to enter into a consortium using the TIROS-N series? Or what if Interior, a member of the Inter-Agency Advisory Board, were to enter into a consortium to fly Mapsat? Since we are planning to serve cartographic users, Interior would be competing with us in selling data to cartographers. Our system is designed to provide data to a broad spectrum of users, reflecting the emerging market. We are therefore opposed to government subsidies to specialized competitors flowing through the consortium vehicle.

b. Yes. Presumably an agency's mission would have to be furthered by a consortium, or appropriations would not be enacted. Yes.

10. Yes. The legislation provides for the necessary protection of foreign ground station operators in Sec. 204.

11. --

12. Yes. We support Sec. 602.

ASTRO

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...as A Schmidt
...Vice President
...ional Manager

December 21, 1983

Congressman Harold L. Volkmer
Chairman Subcommittee on Space Science
and Applications.

Congressman James H. Scheuer
Chairman Subcommittee on Natural Resources,
Agriculture Research and Environment

Committee on Science and Technology
Suite 2321 Rayburn House Office Building
Washington, D.C. 20515

Dear Congressman Volkmer and Congressman Scheuer:

Thank you for your letter of December 2 with the enclosed additional questions on the topic of the "Land Remote-Sensing Commercialization Act of 1983". I appreciate this opportunity to amplify RCA's position on this critical and timely topic.

Attached please find my responses to and comments on the specific points raised in your enclosure. For clarity and ease of reference, I have organized my responses consistent with the numbering scheme of the questions.

Again, thank you for the opportunity to participate in your deliberations and if my staff or I can, in any way, be of help during future consideration of this Bill, we would be pleased to do so.

Sincerely,

Charles A. Schmidt

Hearings on Land Remote-Sensing Commercialization Legislation

Questions for All Witnesses

1. The bill was drafted to reflect the following principles ("a" through "j") which summarize the lessons drawn from several previous hearings. Do you think these are valid and useful principles? Do you think the bill reflects these principles? Do you have any specific comments on individual items? (Note that there are some related questions below.)

   a. If we really want to commercialize, we should let the private sector make most of the critical decisions -- we should give them a clear framework in which to operate. For example, we should not dictate technology.

   b. We have had much testimony that data continuity is very important, and in particular that the lack of continuity has adversely affected the market for Landsat data.

   c. A truly commercial system will be driven by user needs -- which may or may not require state-of-the-art technology.

   d. In the beginning, some government subsidy may be needed, but we should encourage the private sector to compete to see how small the subsidy can be.

   e. Phased commercialization starting with the ground segment -- i.e., marketing -- is the most promising approach. Since the existing Landsat system is virtually all in place, its operation is not challenging, but marketing the data it generates is a challenge and perhaps an opportunity.

   f. Both "open skies" (i.e., non-discriminatory access to data) and considerate treatment of foreign ground stations are important U.S. foreign policy concerns. The "open skies" policy should be maintained.

   g. Continuity of competition is important. One-time competition at the time of a contract award is not sufficient.

   h. The value-added business is healthy, commercial, and entrepreneurial. It is the principal stimulus for potential market demand. We should not let anti-competitive practices affect this industry.

   i. Weather satellites perform an inherently governmental function and should not be commercialized.

   j. The Federal Government should continue research in satellite remote sensing.

2. The bill expressly places the responsibility on all operators to sell data on a non-discriminatory basis (i.e., equal availability and equal price for the same services to all comers). In this the bill would maintain the current U.S. policy of "open skies".

   a. Can a healthy market be developed within such a policy framework?

   b. Is such a policy socially and economically just?

   c. Is there any feasible alternative that could preserve our current international policy?

   d. Are there foreign policy benefits to the U.S. from maintaining this policy?

   e. Under private sector operation, should there be public disclosure of the names of those purchasing data and the scenes that they have purchased?

   f. Should a listing of all available scenes be published by the operator? How promptly should this listing be published?

3. Some of the problems that the SEB has had in writing the RFP have been related to national security.

   a. One problem is that any system operator may be required to have certain excess capacities or standby capabilities to meet national security requirements. Who should pay for any extra costs of such requirements? Should civilian users pay? Should the Department of Commerce pay? What is your view of Sec. 608 (c) of the bill, which authorizes the Secretary of Commerce to require agencies to reimburse a licensee on the basis of such requirements?

   b. If DOD (for example) were to have a strict requirement for a highly reliable and continuously available (if not continuously utilized) capability, should this capability be maintained as part of a commercial system or should it be pulled out of the commercial system and operated totally as a DOD system?

   c. Assume the following case: A private operator receives a federal license under Title IV to launch a particular sensor. A year later, the license is revoked because the government has become aware of potential applications of the sensor which could compromise national security. Should legislation explicitly foresee this type of situation? If so, what remedies for the operator would you suggest, if any, to compensate him for lost revenues?

4. The draft bill (in Sections 202 and 303) treats any product beyond the raw data as a "value-added" product which can be sold by the operator only with certain restrictions.

   a. Are existing anti-trust laws sufficient to offer protection to the value-added entrepreneur?

   b. Do any additional steps need to be taken to stimulate the value-added industry?

5. Under this bill, the operator of the future system under Title III could very well be different than the operator of the present system under Title II.

   a. Does the Title II operator have sufficient motivation to be aggressive about expanding the market for data sales? Or would he basically serve as caretaker of the current system?

   b. Are the provisions of the bill sufficient to build up a market under Title II that will be of benefit to the operator under Title III? (I.e., does the clear separation between these two operators enhance the competition and diversity of the industry as we intended?)

   c. Where do you think the market will be for the Title II operator? For "MSS" (Multi-Spectral Scanner) data? For "TM" (Thematic Mapper) data? How about for the Title III operator?

   d. Title III posits a period of six years of government support after which industry will presumably be able to determine whether land remote-sensing is a viable commercial enterprise. Is six years (after the demise of Landsat 5) sufficient time to make an assessment about the feasibility of private land remote-sensing ventures?

6. The draft bill represents an honest attempt to commercialize land remote-sensing as rapidly as possible with minimal government subsidy. As such, it offers no special protection for States, for Federal agencies purchasing data, for university researchers, or for current and future foreign users. Should the bill contain provisions to protect or subsidize such users?

7. The bill, in Title III, provides for at least six years of data continuity for MSS data. Advanced technologies may be employed at the operator's expense.

   a. Should data continuity linked to past and present needs remain the goal of this bill? If so, is the approach outlined in Title III a useful means of guaranteeing such continuity? If not, what is the government's minimum responsibility?

   b. Is it appropriate that the private sector make the high risk decisions necessary to implement advanced technologies? If not the private sector, then who?

c. Is there any reasonable way for the government to ascertain in advance the market for advanced technology?

d. Is it reasonable to assume that the use of advanced technologies should and will be user-driven? Should the government, through legislation, push specific technologies on users?

e. Is the six-year period specified in the bill sufficient to allow present users to amortize the investments already made in equipment and training?

8. In Title II, the bill effectively terminates government involvement in satellite hardware with Landsat D'.

a. How old is this technology, i.e., when was Landsat D' designed? Have there been advances since then?

b. Is there any compelling need to continue production of the Landsat D series? Would it not be more efficient to produce newer technology?

c. Can the private sector react efficiently to prevent or minimize a data gap after the demise of D'?

9. The bill in Sec. 403 (b) encourages Federal agencies to enter into consortium-like relationships with the private sector.

a. Are there any potential conflicts-of-interest in such a plan?

b. Could such a consortium help to serve the individual needs of various Federal agencies? Could it enhance the viability of remote-sensing industry?

10. Does the United States have any obligations to the countries that have invested several million dollars in their Landsat receiving stations?

11. How should the government treat any private sector plans to begin ocean remote sensing?

12. Should any private operator of a remote-sensing system be required to maintain a data archive?

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Question 1

a. RCA agrees with this statement with some reservations. The private sector should be responsible for the key decisions but the government should establish some form of minimum criteria to give a reasonable assurance of success. The bill would benefit from some clarification on the points of technology as it specifically calls out "MSS data" in several cases that should be deleted in favor of a more general statement on the appropriate technology.

b. Data continuity is critical to the successful commercialization enterprise. Furthermore, as in any commercial market, reliability and continuous availability of products are required if the customer's confidence in and use of the data are to be achieved. It should be pointed out, however, that data continuity is not the unique requirements and should not automatically be emphasized over data quality and reliability of delivery which are also critical.

c. This statement is true of any commercial enterprise and remote land sensing is no exception. User needs must drive both the operational system and R&D. Our analysis shows, however, that in the case of earth remote sensing state-of-the-art technology will be required to insure commercial feasibility.

d. Subsidy will be required to allow an orderly transition to a commercial operational system. As with all such programs, the government should foster competition to both minimize the subsidy and ensure that a timely viable commercial entity emerges that will not require permanent government subsidy. This should be, in our opinion, the ultimate goal of both the legislation and the RFP process.

e. Phased commercialization can be detrimental to successful commercialization. The initial operator during transition must be the final operator after transition. This is necessary to build the experience and capability to expand the market. It is, however, entirely possible to have the transition phase as a contracted phase with the final operating entity. This is further expanded in the response to Question 5, below. The same concerns expressed in Question 1a above about minimum standards also apply here.

f. The "open skies" policy as originally stated should be followed. Question 2 treats this in more detail.

g. Competition at any intervals short of that necessary to make this a going business is undesirable and may well prevent companies from bidding. There is no incentive for a company to take all the risk only to have their activity compete again once it begins to pay off. If commercialization is successful, competition for further government subsidy will be unnecessary provided the contractual period is adequate for rationale transition. As far as competition for data sales to government in the post transition period is concerned, we feel the government should do so if they determine it is in their best interest.

h. We are in total agreement with this objective. Any value-added element of the winning entity must compete on equal terms with all other value-added companies.

i. We completely agree with this position. As we have previously stated, the owner and operator is the government; the taxpayer the ultimate customer.

j. The continuation of advanced research with sensors and related technology by the govenment is essential to maintain U.S. leadership, however, competition with private industry in operational use of these data must be avoided.

Question 2

a. A healthy market can be maintained under the "open skies" policy as stated, that is "equal availability and service" for the same price. Current restraints, for example most industrial users do not want to have disclosed the area coverage they are interested in, should be maintained as they are at present. Further, most users would desire some opportunity to use data that is collected at their specific request before it appears in an open archive. The equal availability of specified service meets the "open skies" policy.

b. We believe this policy to be socially and economically just.

c. The open sky "equal availability and service" policy is adequate. However, one must not penalize a user who is capable of exploiting this data by publicizing his unique collection requirements.

d. The foreign benefits cannot be quantified but probably exist depending on what the Europeans, Russians and Japanese do.

e. From a. and c. above, it is clear that the answer is no. Industry is always willing to buy a service or data that may through proper application give them a competitive edge. That's what the free enterprise system is all about. At present, under the current LANDSAT system, this information is not disclosed and we see no reason to deviate from this policy. In fact, our market analysis indicates that public disclosure of details such as these may well be catastrophic to commercial market development.

f. A list should be published, as available, of all scenes collected for synoptic coverage. However, unique scenes location, spectral intervals, etc. bought and paid for by a specific customer should not be listed from a time sufficient for that user to benefit from his request (6 months to one year). This situation does not prevent another customer from requesting that same coverage, which would also be treated as a new request, i.e. collected and provided to the new user.

Question 3

a. Those specific costs above doing "normal business" that relate to the national security requirements should be reimbursed by the government. Such reimbursement could be either by Commerce or DoD.

b. If DoD wanted to increase the probability of continuous coverage, the least expensive approach would probably be to enhance the existing commercial system. This can never be stated for certain until a specific system can be studied.

c. A specific license to fly a new sensor would be based on the exploitation of a new or expanded market that both the government and the commercial entity felt would be beneficial. If in the course of operation it was found that these data were of interest in a national security sense, three courses of action are open: 1. continue as is and accept risk; 2. continue as is with the U. S. government the only customer; 3. cut off sensor output. In the first two cases, the commercial entity receives its return on its investment. In the last case, we believe the government should be responsible to compensate the commercial entity for its expense and lost revenue.

Question 4

a. It is our opinion that today's anti-trust laws appear adequate.

b. The value-added industry needs further stimulation but mainly through applications research and education of the data users. Simulation of the value added industry in general is a logical function of the commercial operator of the system since it would serve to extend his market. We would anticipate a major effort to do this.

Question 5

a. The present potential separation of Title II and Title III is detrimental to the commercialization of the LANDSAT system. It is absolutely vital that the same entity do both. This is necessary to not only have an incentive to build the market, but to gain experience in developing the next phase. See also answer to Question 1.e.

b. See answer to Question 1.e and 5.a.

c. As stated above, there should be no separation between the commercial entity for transition through full commercialization. The sensors will evolve as the market strategy dictates and this cannot be done with discontinuities in the operations.

d. Six years appears to be a minimum, 10 or more would be more effective in order to lay a good business basis. The time constant from the introduction of a new capability to its exploitation is on the order of 5 to 7 years. If the time is too short, it prohibits the entity from investing into long range improvements that are essential to maintain and expand the market and the U.S. leadership. It is essential that the commercial operator be motivated by long term business development for the transition period to be successful. Only in this way can the true objective of the commercialization effort be realized.

Question 6

a. An effective market strategy must in itself "increase the market" which is not done by reducing customers. For this reason, the commercial entity will do all it can to foster university research, state and local government use as well as expanding the foreign markets. Therefore, special provisions do not appear necessary. This effort should not be construed as pre-empting or any way interfering with efforts by the government to acquire data for research purposes from the entity. This data could be forwarded to universities and/or other researchers under license agreements on similar instruments. This, in effect, would allow subsidy of research if deemed beneficial to the common good.

Question 7

a. The approach to data continuity provided in the present bill is good. A good market plan will continue existing customer support until those customers are ready to move to more advanced data. As stated earlier, the response of the market to a new type data is very slow, from 5 to 7 years from data entry to full exploitation.

b. The private sector, through experience gained in the transition, market analysis and surveys, must be the one to make the decision to bring new technologies into the operational system. This must be a market driven not technology driven decision. Foreign competition will also have an influence on this.

c. The government should try to assess the market need for advanced technology but not alone. It should also work closely with the private entity operating the commercial system.

d. Legislation cannot be expected to drive the market. As stated above, application of advance technologies will be by user and, therefore, market driven. There should be no legislation promoting specific technologies for use by the commercial entity. The government should continue, however, to sponsor a rigorous basic Research and Development program through NASA and other appropriate agencies to provide the basic technology from which commercially viable sensors can be developed.

e. As noted in Questions 5.d. and 7.a., the six year period is an absolute minimum and will probably not be sufficient, 10 years would probably be preferable.

Question 8

a. LANDSAT D' is basically 1975 technology. Other more cost effective solutions are possible now.

b. There is no compelling need to continue the LANDSAT D' series. The present technologies coupled with the design of an operational vs. research system would yield distinct cost advantages.

c. The question of a data gap between D' and a follow-on is totally related to the life of D'. The time it takes from go-ahead to flight of a follow-on will not vary radically among viable aerospace contractors. If LANDSAT D' meets its specified life and if there are no major delays in enabling legislation and/or the RFP process it will be possible to avoid a data gap after the demise of LANDSAT D'.

Question 9

a. Potential conflicts-of-interest only lie with a single market (government agency) having an undue influence in the evolution of the industry.

b. In general, a consortium may hinder the development of new markets and should be carefully evaluated. This is not a strong position but one of the unknowns that should be further evaluated on a case by case basis.

Question 10

Yes, at least a moral obligation to try to minimize any impact due to our changes of policy.

Question 11

If the private entity can establish a sufficient market basis for observational ocean sensing, it should be allowed to proceed as long as it is not detrimental to the national defense or national interest. This should not be construed as a conflict with either systems that provide for military needs or with basic science programs that pertain to ocean observations.

Question 12

The establishment of a non-government data archive should be a business decision. It does appear that some level of archiving would be in the best interest of a private enterprise, whether required or not. The government should retain the option to archive any data the commercial operator may choose not to. The government should also retain the right to reclaim archived data from a private library at any time if required by national security considerations.

CHRONOLOGY AND LIST OF ATTACHMENTS

April 9, 1981 - COMSAT submits proposition on land and weather satellites.

July 13, 1981 - Deputy Director of OMB responds to COMSAT request to add weather satellites to commercialization discussion (Attachment A).

December 15, 1981 - Charyk of COMSAT submits EARTHSTAR document (Attachment B).

December 16, 1981 - CCCT meeting concludes further information is needed.

December 28, 1981 - Deputy Secretary of Commerce Wright records the continuing recommendation by J. Lynn, representing COMSAT, to cripple the weather satellite program through budget cuts to force commercialization (Attachment C). Memo does not record dates when COMSAT recommendations were made, but cuts imposed on land and weather satellite systems in preceding months included elimination of:

- o Landsat-D"
- o Landsat-D"'
- o One of two polar-orbiting weather satellites

March 15, 1982 - J. Lynn, representing COMSAT, provides anonymous option papers for use in White House (Attachment D).

March 16, 1982 - Charyk of COMSAT submits EARTHSTAR Update.

March 17, 1982 - First job interview between Fiske and Charyk of COMSAT (Attachment E).

March 17, 1982 - CCCT meeting concludes special study on national security implications of commercialization is necessary.

March 23, 1982 - Second job interview between Fiske and Charyk (Attachment E).

April 20, 1982 - CCCT concludes Landsat commercialization should continue, but weather satellites should stay under Government management (see Attachments F and G).

April 30, 1982 - Fiske introduced to senior NOAA officials in J. Byrne's office.

May 1982 - COMSAT protests CCCT decision to Secretary Baldrige.

May 5, 1982 - Third job interview between Fiske and Charyk (Attachment E).

May 17, 1982 - Fiske formally nominated by Senate as Deputy Secretary of Commerce.

May 18, 1982 - Fiske begins briefings by NOAA/NESS on weather satellites.

May 18, 1982 - NOAA directed to meet with COMSAT to explain April CCCT decision. Meeting occurs and leads to a written document that is delivered to COMSAT for their response (see Attachment H and June 3).

June 3, 1982 - NOAA issue paper on private sector transfer is delivered to COMSAT (see Attachment I).

June 7-8, 1982 - First meeting of Halbouty committee.

June 1982 - Work is begun on Commerce Business Daily Request for Information suggested by Halbouty committee.

July 15, 1982 - Charyk of COMSAT provides response to CCCT decision--asserts all concerns can be satisfied.

July 22, 1982 - OMB transmits changes to RFI that change it from a CCCT action to a Secretary of Commerce action because CCCT decision had not been reopened since April meeting (Attachment J).

July 29, 1982 - Fiske meets with J. Lynn, representing COMSAT (Attachments E and K).

September 7, 1982 - Approval is obtained on body of Request for Information.

- COMSAT queries NOAA/NESS about the addition of a Preamble, after body of Request has been submitted for publication. Later Calio provides a copy of a Preamble supplied by Fiske that was to be added to Request--sections or all of Preamble were either provided by COMSAT or taken from COMSAT documents, including one section that incorrectly states U.S. policy in favor of the COMSAT position. Preamble was then edited and published. (See Attachment L).

September 1982 - J. Lynn takes Fiske to lunch (Attachment E).

October 22, 1982 - Responses from industry are received. Only one favors immediate commercialization of land and weather satellites-COMSAT's (Attachment M).

November 5, 1982 - Fourth job interview between Fiske and Charyk (Attachment E).

November 1982 - Fiske attends benefit with Cha[illegible] (Attachment E).

November 19, 1982 - Halbouty committee and Peck-Charles committees complete evaluations of industry submissions. (See documents room, DOC, for copies).

November 30, 1982 - Fiske meets with J. Lynn (Attachment E).

December 1982 - Successive briefings to Bayer, Fiske, and Baldrige which are incrementally modified until the recommendation to the CCCT becomes one of seeking a single bid for all systems--the closest feasible position to that desired by COMSAT. Fiske plays a major role, as does his assistant, Bayer. (See DOC documents room for copies and Attachment N for summary of changes.)

December 15, 1982 - CCCT endorses immediate transfer of land and weather satellites, but rejects Commerce recommendation on seeking one bid for all systems (Attachment O).

December 16, 1982 - Day after CCCT meeting, Fiske's assistant, Bayer, discusses with COMSAT procedures for transfer and receives from COMSAT the following day a written discussion of procedures. It includes cautions against undue reliance on procurement law precedents and warns that interagency representatives must not have too direct a role in carrying out the transfer. Recommends that the transfer be carried out by a small team of senior officials--marginal notes by Bayer designate Deputy Secretary, the General Counsel or Associate General Counsel, and the Deputy Administrator of NOAA (Attachment P).

December 18, 1982 - Charyk and Lynn attend Christmas party at Fiske's home (Attachment E).

January 19, 1983 - Congressionally mandated NOAA study completed and submitted to Department for clearance. Fiske's assistant, Bayer, later provides copy to COMSAT for review and comment--before release to other agencies or to Congress.

February 7, 1983 - Fiske's assistant, Bayer, receives COMSAT's comments on report (Attachment Q).

March 9, 1983 - Structure for transfer is established with a management oversight team made up of Deputy Secretary and Associate General Counsel, Deputy Administrator of NOAA, and Assistant Secretary for Administration. Interagency board is established outside of direct oversight. Influence of Calio forces remaining structure into that of a NASA Source Evaluation Board (Attachment R).

March 1983 - Editing continues on report to Congress. (Attachment S provides examples of editing.)

March 8, 1983 - President announces transfer decision (Attachment T).

March 28, 1983 - Fiske receives letter from Executive Recruiter that he is no longer in consideration for position as President of COMSAT (Attachment E).

April 1983 - Fiske and Bayer are recused from further involvement in satellite commercialization, but retain management responsibility over NOAA's budget and operations.

April 14, 1983 - Secretary Baldrige testifies that the inclusion of weather satellites in commercialization is mainly to provide revenues to support Landsat (Attachment U).

April 25, 1983 - Fiske says, according to Aviation Week & Space Technology, "I have no intention of leaving Commerce for COMSAT and never did," and "...all the policy work was done at the National Oceanic and Atmospheric Administration." (Attachment V)

April 27, 1983 - Congressman James H. Scheuer requests Dr. Joseph Charyk, Secretary of Commerce Baldrige and Deputy Secretary of Commerce Fiske regarding interactions between Fiske and COMSAT (Attachment W).

April 29 & May 2, 1983 - COMSAT, Baldrige, and Fiske respond to Scheuer's requests (Attachments X, Y, and Z)

May 14, 1983 - Deputy Secretary of Commerce Fiske resigns.

May 23, 1983 - Congressman James H. Scheuer summarizes Subcommittee investigation of Guy Fiske in letter to Attorney General William French Smith (Attachment AA).

OBSERVATION

COMSAT has at stake a 15-year contract at $330 million per year, a total of $4.95 billion. This is one of the largest contracts in the history of the civil space program.

Executive Order 11222, May 8, 1965, directs that federal employees are to avoid any action that might result in, or create the appearance of--

- o Using public office for private gain. (Job interviews and social contacts with President of the company which may gain a major contract might fit the "appearance" aspect of this category.)

- o Giving preferential treatment to any organization or person. (Providing unequal, ready access, discussing internal Cabinet matters, reviewing courses of action, and allowing a particular firm the opportunity to influence an internal Government report for Congress might fit this category.)

- o Impeding Government efficiency or economy. (Considering, if this was done, crippling cuts in satellite programs to force commercialization might fit this aspect.)

- o Losing independence or impartiality of action. (Job interviews and social contacts might affect judgments--even inadvertently--or create the appearance of having done so.)

- o Making a Government decision outside official channels. (The CCCT had made its decision in April 20, 1982. The participating agencies considered it a closed issue. See the July 22, 1982, editing of the Request for Information by OMB. COMSAT was allowed to overrule that decision without the concurrence of the other CCCT members.)

- o Affecting adversely the confidence of the public in the integrity of the Government. (Revelations of job interviews and the resulting recusals might not constructively contribute to public confidence.)

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

Attachment A

July 13, 1981

MEMORANDUM TO: CRAIG FULLER / MARTIN ANDERSON

FROM: Ed Harper

SUBJECT: Resolution of Issues Related to Private Sector Transfer of Civil Land Observing Satellite Activit:

The purpose of this memo is to request that a working group within the Cabinet Council system be established to consider the following two issues related to private sector transfer of civil land observing satellite activities:

- What is the best mechanism to implement the current policy of transfer of civil land remote sensing systems (LANDSAT) to the private sector as soon as possible?

- Should the Administration consider simultaneously private sector transfer of both civil weather and land remote sensing systems?

Background

With the revisions to the 1982 Budget the Administration explicitly stated its intention to hand-off operational responsibilities for land remote sensing to the private sector in the mid-1980's or sooner, if possible. This policy reflected the judgment that the Federal investments in the LANDSAT program contained in the revised budget were sufficient to evaluate the usefulness of this data and that, if the operational uses were significant, the private sector would provide follow-on satellites--there would be no need for the Federal Government to purchase additional satellites beyond the two new NASA budgeted satellites (i.e., LANDSAT D and D1). Thus, the Administration withdrew the Carter commitment to data continuity through the end of the decade and decided that additional satellites beyond the two new NASA satellites would depend on the private sector's willingness to invest in and operate follow-on satellites. We are not asking the Cabinet Council to revisit this policy.

The Department of Commerce (NOAA) is currently developing draft legislation designed to facilitate private sector transfer of land observing satellite activities. This legislation needs to be consistent with the policy decisions on the issues being referred to the Cabinet Council.

A potential private sector owner/operator has requested that the Administration consider transferring simultaneously both the civil weather and land remote sensing satellite systems to the private sector, and that selection of a private sector proposal or combination of proposals be based on the merits of the total package.

Discussion of Issues

o What is the best mechanism to implement the current policy of private sector transfer, as soon as possible? The options available to the Administration seem to be the following:

-- Laissez-faire approach--continue NOAA operation of satellites consistent with current policy and do nothing to encourage or discourage independent private sector initiatives.

-- A decision to consider transferring the current Government inventory of civil remote sensing satellites and ground equipment to a private corporation or consortium of private corporations in return for cash and/or future considerations.

-- A decision to provide some form of subsidy or long-term data contract (details to be specified consistent with budget of user agencies) in order to facilitate private sector transfer.

-- A combination of the two previous options.

-- A decision to establish a federally chartered for-profit private corporation to own and operate a civil, land remote sensing satellite system--along the lines envisioned in the Schmitt Bill introduced in the previous Congress.

o Should the Administration simultaneously consider private sector transfer of both civil weather and land remote sensing systems?

-- Transfer of the civil weather satellite program to the private sector would place more emphasis on the private sector and market forces in determining the level and scope of these satellite activities. However, the assertion that such a transfer could reduce the Federal budget and increase the Federal tax base without incurring significant additional Federal risks has not yet been validated.

-- The Administration probably will not be able to determine if such a private sector transfer can be achieved on terms acceptable to the Government until proposals are received and evaluated.

o The sub-issues that will need serious review and consideration include:

-- What type of Federal commitment, if any, would be appropriate for purchase of either weather and/or land satellite data? To what extent should the Federal Government continue related technology development (e.g., R&D on advanced sensors)?

-- What type of relationship should exist between the Government and any potential private sector owner/operator?

-- What Federal assets and data rights should the Government consider transferring to the private sector?

Budget Assumotions

- o In light of the need for fiscal restraint, an increase in the Federal commitment to land remote sensing from space should be considered only to the extent that user agencies are willing to make tradeoffs against previously approved activities for 1983 and beyond in order to facilitate an expanded Federal commitment.
- o Since there are other options for reducing the Federal expenditures for needed weather satellite data (e.g., combining civil/military polar-orbiting satellites, reducing the number of civil weather satellites in orbit, and placing weather sensors on commercial communications satellites), it should be assumed that the 1983-86 budget projections for civil weather satellites may be revised downward.

The agencies affected include:

Agency	Area Affected
Department of Commerce	NOAA operation of weather and land satellite systems.
Department of Agriculture	Agriculture forecasting based on weather and land satellite data.
Department of Defense	Data from civil weather satellites (in addition to data from military weather satellites).
Department of Interior	Geological, mineral, and land - management activities use land satellite data.
Department of State	International agreements on satellite remote sensing.
Central Intelligence Agency	National security.
National Aeronautics and Space Administration	R&D using satellite data and new sensor development for weather and land satellites.

Attachment B

OFFICE OF THE SECRETARY
EXECUTIVE SECRETARIAT
DEC 15 1 56 PM '81

COMSAT

COMMUNICATIONS SATELLITE CORPORATION

JOSEPH V. CHARYK
President and Chief Executive Officer

December 15, 1981

The Honorable Malcolm Baldrige
Secretary of Commerce
and
Chairman of the Council on Commerce
and Trade
Department of Commerce
Washington, D. C.

Dear Secretary Baldrige:

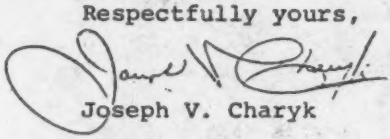
I am pleased to submit for consideration by the Council in connection with its meeting tomorrow a document presenting COMSAT's EARTHSTAR System approach to the commercialization of the civil remote sensing activities (weather and land) of the United States. The document explains in greater detail the concept which John Harper previously discussed with you.

We believe that in addition to reducing Federal outlays for the collection and initial processing of satellite data by as much as $400 million in FY 1983 and nearly $750 million in the period FY 83-87, EARTHSTAR would also preserve U. S. leadership in civil remote sensing, provide continuity of data, and enable the Government to devote resources to basic and advanced technology research in this field.

I urge the Council to consider favorably our proposal as a step in the preparation of the FY 1983 budget. We look forward to working with you and the other members of the Administration to bring EARTHSTAR into operation.

As you know, we have over the months had some correspondence with the Director of OMB regarding EARTHSTAR and, accordingly, are sending him a copy of the enclosed document.

Respectfully yours,



Joseph V. Charyk

Enclosure

Copy to The Honorable David A. Stockman

THE DEPUTY SECRETARY OF COMMERCE
WASHINGTON, D.C. 20230
COUNSEL

Attachment C

DEC 29 8 00 AM '81

December 28, 1981

MEMORANDUM TO: Dennis Kass
John Byrne
Sherman Unger

FROM: Joseph R. Wright, Jr.

SUBJECT: LANDSAT/Weather Satellites

As you know, I requested that the weather satellite question be taken off the Cabinet Council agenda several weeks ago.

Jim Lynn has called me several times representing COMSAT and he was interested in reducing the future weather satellite budget to the extent to where it had to be spun off to the outside community. I mentioned to Jim that I did not feel that this was the appropriate way to go -- that it should be discussed as a policy issue before CCCT -- that NOAA is coming up with a review of the potential consolidation of all weather satellite systems -- and it should be brought up before CCCT again around the second or third week in January.

John, would you please make sure the option paper is put together and is coordinated with Sherman.

Dennis, would you please put this on the CCCT agenda for some time soon after the Secretary's return from his African trip.

Thanks.

Attachment D

3/15/82

OPTIONS FOR CIVILIAN SATELLITE REMOTE SENSING

BACKGROUND

Presidential Directive (PD) 54 was issued November 16, 1979 to set the policies for civilian operational remote sensing during the 1980's. PD 54 assigned management responsibilities for all civil operational remote sensing (land, atmospheric and ocean) to the National Oceanic and Atmospheric Administration (NOAA) in the Department of Commerce. Key policies of PD 54 included the following:

- Maintenance of separate military and civil weather satellite programs because of their differing needs;
- Establishment of the goal of eventual operation of civil land remote sensing by the privat sector; and
- Direction to NOAA, Commerce to seek ways to "enhance private sector opportunities" in satellite remote sensing.

In June 1980, NOAA issued a Transition Plan which contained a discussion of issues and options with respect to transfer of land remote sensing to the private sector. NOAA concluded that the transfer of land remote sensing to the private sector could not take place until at least the 1988-89 time period. In the interim, NOAA planned to manage the LANDSAT D and LANDSAT D Prime systems, seek legislation authorizing it to do so (and also to select and regulate a private operator), and to begin to develop the market for land remote sensing data products.

In the FY83 Budget, the Administration proposes that NOAA assume responsibility in 1983 for operating the LANDSAT system and begin to recover the systems' operating costs through the collection of user fees from the sale of data and data products to federal and non-federal users. The Budget also contemplates commencement of a commercial program to sell data from the LANDSAT system in 1983 and funds the launch in 1986 of LANDSAT D Prime. Apparently as a cost saving move, the Budget proposes the reduction of polar orbiting weather satellites from two to one.

In recent months, consideration of turning over the LANDSAT system to the private sector has been expanded to include "privatizing" the weather remote sensing functions of NOAA. The purpose of this paper is to set forth options as identified thus far, and outline the pros and cons of each, to facilitate decision-making on this Administration's policies on the subjects of management of civilian remote sensing and expansion of commercial markets for remote sensing data.

These decisions should be made now, because depending on the option selected: (a) material budget savings are possible; (b) the nation's efforts at land remote sensing (LANDSAT) may end by 1988 or before if launch or systems failure occur; and (c) given the lead time requirements for the procurement and construction of satellites, deferral of decision-making may prejudice, if not foreclose, later choices involving private sector interests.

Option A - Continued Government Ownership and Operation by Present Agencies

NOAA would continue to own and operate the civil remote sensing satellite systems for the foreseeable future.

Pros:

1. Any change as to departmental and agency responsibilities or as to governmental versus private sector responsibility raises concerns of various kinds within the Government and by various non-Government users as to whether or not the change will result in more harm than good, -- the "if it ain't broke, don't fix it" argument. Meeting such concerns will require time and attention of top officials of departments and agencies who already have a full agenda.

2. U.S. companies providing hardware (e.g., satellites and processing equipment) and services would be assured of a continuing, albeit reduced market.

3. Existing arrangements between the U.S. and other cooperating countries and international organizations would continue as is. Substituting a private company as the supplier of such satellite services to the U.S. and to such other countries and international organizations might complicate these arrangements at least to some extent.

4. NOAA and NASA would have time to demonstrate the extent to which further budgetary and personnel cuts could be achieved, for example, by adopting efficiencies in operations and procurements which have been identified by private sector interests seeking to take over the operations, by development of commercial markets and by imposing fees on the products it now provides to non-Government users.

5. There would be no need to work out with the private sector arrangements for meeting national security needs for additional data or for a full or partial takeover of a system in times of emergency.

Cons:

1. Given competing budgetary demands within NOAA, NASA and Government-wide, it is very difficult to justify continued land remote sensing (LANDSAT) by the Government after the LANDSAT D Prime scheduled for launch in 1986 ceases functioning, particularly if privatization would result in the same if not better data to the Government at less cost.

2. For the same reason -- Budgetary restraint -- reduction in polar-orbiting NOAA weather satellites from two to one has been proposed, notwithstanding that this cuts the number of global observations of the earth from four to two a day and risks a total shutdown of global observations if the remaining satellite fails. Reduction of hemispheric coverage provided by the GOES satellites is also under consideration.

3. Given the spending necessary to continue Government ownership and operation, funding for basic and advanced research and development for civilian remote sensing will continue to be squeezed.

4. The Government does not have the incentives or flexibility towards achieving efficiencies and savings that the private sector has.

5. Likewise, the Government does not have an increasing dependence on -- and hence the incentive or experience that the private sector has to develop -- a viable commercial market.

6. Concurrent with a decline in the U.S. Government commitments to remote sensing, certain European and Japanese governments are mounting full scale efforts to achieve remote sensing leadership, including land remote sensing. This will in all probability lead to in the years ahead: (a) a withering of markets for U.S. suppliers of satellites, processing equipment and services; (b) exposure of U.S. users to fee schedules imposed by foreign governments in their development of commercial markets, and (c) decline in U. S. influence on international arrangements.

7. With continued Government operations, the interested Government agencies, including user agencies, and elements in the Congress will probably try to make a case every year that more outlays are needed to help the U. S. maintain a leadership position. This can lead to outlays beyond what those agencies presently project.

8. Without a clear signal that the Administration wants to proceed expeditiously toward privatization, the few U.S. companies who have expressed interest in assuming responsibility may well, given other investment

opportunities and the further footholds being gained by foreign competitors, lose interest.

9. The private sector already has significant responsibilities in operating facilities essential to national security, e.g., operation of nuclear munitions plants, and there is no reason to believe national security interests cannot be properly protected in the arrangements with the private operator of the remote sensing systems.

Option B - Establish as Policy the Operation and Development of Combined Remote Sensing System in the Private Sector and Begin Implementation

The Administration would make the policy decision now to transfer to the private sector the combined ownership and operation of the system for both land and weather remote sensing, and to procure data from such private operator under long term contract. This private company would purchase the present U.S. civil remote sensing satellites and certain associated facilities, would finance and own all new satellites and facilities required, and in addition to providing data to the U.S. Government, develop commercial markets for new uses of data and services from such a system.

As first steps in the implementation of this policy, the Administration would publish such a policy and promptly begin discussions with companies evidencing interest to identify the most likely operators, negotiate the details of an appropriate arrangement, and develop implementing legislation (which, depending on the results of what is learned in such discussions and negotiations with potential owner/operators, would propose a designated owner/operator, a process for Executive Branch selection of such owner/operator or a new statutory corporation).

There have been expressions of interest by several companies in the private sector.

Pros:

1. It is likely that adoption and implementation of this full privatization option would result in material budget savings. For example, the EARTHSTAR proposal of COMSAT as currently updated estimates payment of approximately $300 million ($230 million in FY83) to purchase satellites and related facilities from the Government, a total reduction in Government outlays in an order of magnitude of $620 million over the period FY83-87 and reduction in Government outlays of at least $80 million per year thereafter. For purposes of its comparison, COMSAT assumes in both cases --

with or without privatization -- two polar satellites and continuation of land remote sensing beyond D Prime. If the Administration wants only one polar satellite (and Congress concurs) this would reduce costs in both cases. The outlay reductions over the years apart from the equipment sales by the Government is expected to come from more efficient procurement and operations, e.g., consolidation of various meteorological and land remote sensing facilities, and the sharing by the Government, through reduced fees, of the corporation's success in the commercialization of remote sensing.

2. Continuity of the present remote sensing programs -- a full land sensing program and 2 GOES and 2 NOAA's -- could be assured, thus encouraging both users and companies furnishing value-added services to undertake the needed investments in time and equipment to make full use of the satellite data. In addition, a private company would have the incentive to develop new payload technologies including the addition of new sensor packages on future satellites (e.g., a stereoscopic capability for land remote sensing).

3. With Government outlays for operations substantially reduced and the private company devoting appropriate resources to applications research and development, the Government could concentrate on basic and advanced R&D, an essential Government role.

4. Maximum development of commercial markets would be better achieved by a private company thus lessening the risk of U.S. users having to go to foreign governmental or intergovernmental agencies for the data. The private company will have a strong incentive -- profits -- to develop new markets and meet user requirements for the satellite data and services. These factors should result in a continued prominent manufacturing role for U.S. suppliers of satellites and related hardware.

5. Success in achieving the foregoing would work toward preservation of the U.S. leadership position, including leadership with respect to the export of data and services. This would better enable the U.S. to ensure that any eventual "internationalization" of remote sensing is compatible with U.S. foreign policy objectives.

6. The transfer of civil remote sensing activities to a private corporation would permit a reduction in Government personnel.

7. The transfer would be in furtherance of the Administration's policy to leave to the private sector functions that are not by their nature inherently Government functions.

Cons:

1. Of the range of options presented, this is the most distinct from Option A (continued Government ownership and operation by present agencies) and thus will probably require the most time and attention of top officials.

2. The contractual arrangements between the United States Government and the private company will require careful analysis and imagination to assure proper balance between their respective interests. It will be necessary in such arrangements to anticipate various situations that might arise, e.g., national defense backup and the effect of interference with market competition by one or more foreign country's subsidization of its commercial efforts.

3. The responsibilities of the U.S. Government and a private company vis-a-vis arrangements with other countries and international organizations will have to be worked out, and aspects of current arrangements will probably require some modification, which may be resisted.

4. There could be adverse political repercussions if -- notwithstanding contractual arrangements whereby the U.S. Government shares (through lower charges) in successful commercialization efforts and the company assumes appropriate risks of failure of commercialization efforts - the company enjoys high profitability. (However, the Government should be able to achieve an appropriate balance of interests in negotiation.)

5. The Government and the private sector may be unable to agree on detailed terms acceptable to both (but we will never know until we try).

Option C - Cost Comparison Study of Option A and Option B Before Policy Decision

Under this option, the Government would undertake a fairly detailed cost comparison along the lines of A-76 before deciding

the substantive policy issue of whether to "privatize" the weather and/or land satellite systems.

Pros:

1. Such a detailed study would, if achieved, afford a better idea of the comparative costs, and it would be useful to have more complete data as to whether there are appreciable savings in "privatizing" before deciding on that policy issue.

2. To do such comparative costs analysis would require identifying potential operators and determining in appropriate detail the arrangements they would be willing to enter. This process might uncover obstacles to "privatizing" not yet apparent.

Cons:

1. Without a policy decision to proceed expeditiously toward "privatization", it is unlikely that potential private operators of the system will be willing to commit the considerable resources, both in money and effort, necessary to do the detailed analyses and negotiations to come to terms. In other words, a decision to adopt this option to study may well turn out to be, indirectly, adoption of Option A, the "as is" option and the disappearance of the "privatization" option.

2. At least one potential operator, COMSAT, has done a fairly substantial amount of work, including comparative cost analyses and on other matters that need to be considered toward determining feasibility and advisability, and in this connection has had discussions with representatives of virtually every interested agency as well as some Congressional contact. If the Administration desires further testing of COMSAT's cost analyses, with full agency cooperation COMSAT's comparative costs work could be further verified as to method and "order of magnitude" within a week or two.

Option D - Commercial Development and Operation only of Land Remote Satellite Sensing (LANDSAT)

Under this option, the Government would endeavor to interest a private corporation in taking over the further development and operation of the LANDSAT system, furnishing the Government with its internal data requirements (presumably under a long term

contract) and developing the commercial market. This corporation would purchase the existing land remote sensing satellites and finance and own all new land satellites and facilities. A variation of this option would be to commercialize only the ground segment of the LANDSAT system.

Pros:

1. This limited transfer of civil remote sensing satellites and facilites would implement the previous policy trends as regards the commercialization of land remote sensing systems and avoid having to address the transfer of the weather satellites and the attendant issues it would raise. The need for attention by top department and agency officials would be less than in the case of Option B, though more than in the case of continued Government operation of all civil systems, Option A.

2. The transfer of the Government's land remote sensing operation alone could reduce significantly Federal outlays depending on the value of the assets (e.g., their remaining useful lives) to be sold to the private operator at the time of transfer and the quantity of data that the Government was willing to commit to purchase -- and the price -- from the new private operator.

3. The Government would have some assurance of a continuity of facilities beyond FY86 from which its requirements and those of the non-Government community for land remote sensing data could be supplied. The degree of such assurance would be dependent in large measure on the terms-- price and duration--under which the Government was willing to procure data.

4. Transfer only of the land sensing systems would require less disruption to existing Government programs, institutional arrangements and foreign agreements than would be expected to be the case under Options B.

5. Transfer of only the ground segment would allow the Government to retain control of the satellites.

Cons:

1. Transfer of only the land remote sensing systems will significantly reduce the economies and efficiencies of scale which could otherwise be achieved through private management, ownership and operation of consolidated weather and land facilities, and most likely require Government financial support at a level substantially higher than the continuation of LANDSAT can justify.

2. The technical risks associated with taking over the ownership and operation of the complex and experimental LANDSAT satellites -- including the need in the case of LANDSAT D to rely on the NASA Tracking Data Relay Satellite System (TDRSS) which has yet to be launched and is unproven -- will diminish the attractiveness of these assets to a private purchaser, and, consequently, the price such a purchaser would be willing to pay for these assets. By contrast, the NOAA and GOES weather satellites are operational satellites.

3. The experimental nature of the LANDSAT program and the Government's plan to cease the program after FY88, raises issues as to the Government's intentions and needs for acquiring land remote sensing data after that time. This too will raise the price.

4. Transfer of only the ground segment would result in few efficiences in the operation and management of the system, and would probably not achieve any significant reduction in Government outlays for LANDSAT data.

Attachment E

STATEMENT OF

DEPUTY SECRETARY OF COMMERCE GUY W. FISKE

BEFORE THE

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE

RESEARCH AND ENVIRONMENT

AND THE

SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS

OF THE

COMMITTEE ON SCIENCE AND TECHNOLOGY

UNITED STATES HOUSE OF REPRESENTATIVES

MAY 5, 1983

Chairman Scheuer, Chairman Volkmer, and Members of the Subcommittees. I appreciate the opportunity to appear here today to address the questions raised about my role in developing the proposal to transfer the Landsat and Metsat systems to the private sector.

Since I have never testified before a Congressional Committee except at my confirmation hearings, it may be useful to begin with a brief description of my background. I am a Massachusetts native. I entered Brown University at age 16 and completed my degree in mathematics in 2 1/2 years. In 1943, at age 19, I was commissioned in the U.S. Navy and took part in five landings in the Pacific. I started my business career in 1947 following my discharge from active duty.

My business career -- which I believe is regarded as a successful one -- has spanned 35 years. During that period, I have worked as a corporate executive for General Electric, ITT, and General Dynamics. Immediately before coming to government, I was Executive Vice President of General Dynamics and a member of its Board of Directors.

My first position in government was Under Secretary of Energy, a post I assumed in October 1981. My principal duties consisted of day-to-day management of Energy Department operations. After serving at Energy for about six months, I accepted the position of Deputy Secretary of Commerce. I was nominated to this post on May 17, 1982, and was confirmed by the Senate on June 23, 1982. As at Energy,

my primary role at Commerce is to manage day-to-day operations of the Department. I brought many years of management experience to this role and believe that I have performed it well.

Since the focus of this hearing has shifted from the merits of the satellite transfer proposal to an inquiry into possible conflict of interest, it is also pertinent for me to describe how I have tried to deal with conflict questions during my tenure in government.

In order to join government, I left General Dynamics, where I had a salary of $205,000 per year plus stock options. When I was nominated as Under Secretary of Energy, I had earned the right to purchase over 150,000 shares of General Dynamics stock. However, Energy Department regulations prohibit ownership of stock in companies which do any energy business. Since General Dynamics owned several small coal mines, I had no choice but to exercise my stock options in General Dynamics and then sell the stock.

Before assuming office, I agreed to a divestiture plan for my General Dynamics stock. The plan was approved by the Secretary of Energy and reviewed without objection by the Office of Government Ethics and the Senate Committee on Energy and Natural Resources. I sold all of my stock, in a down market, and, although not required by the plan, I sought no tax-sheltered investments to shield the stock sale from high taxes. As a result, to avoid any appearance of

impropriety in my financial dealings, I paid taxes of over $1,100,000 for the year 1982.1/

I regarded government service as an opportunity to serve my country with skills I had developed and honed durring my business career. I have not complained of the financial sacrifices that my family and I had to make in order to accept this opportunity. But I reject any suggestion that I have used my government position as a means of financial gain.

Since coming to government, I have been careful to establish procedures to avoid conflicts of interests between my official duties and my personal financial affairs. My financial portfolio is handled by the Boston firm of Gardner, Preston & Moss, who have been under instructions to review my investments in order to avoid companies with interests in areas dealt with first by Energy and now by Commerce. Every three months a list of my investments is sent to the General Counsel of the Department of Commerce, and my staff and I routinely recuse ourselves on any matter involving a company on my investment list.

In short, I have tried to be vigilant in avoiding potential conflicts, and I am satisfied that I have been successful in every instance, including the present one, in avoiding impropriety.

1/ I prepaid $386,000 in federal tax in 1982 and paid an additional $620,000 with my federal return in April 1983. I paid an additional $120,000 in Virginia tax for 1982.

I understand that your inquiry today focuses upon contacts that I had, initiated by an executive recruiter, about possible employment after leaving government service with the Communications Satellite Corporation and upon whether those contacts in any way tainted or influenced in Comsat's favor the preliminary decision-making process relating to proposed commercialization of the Landsat and Metsat satellite systems. The answer to the latter question is an unequivocal no. I have already provided the Committee with documentary material and other information concerning my contacts with Comsat, and I am grateful for the opportunity to appear in person to set the Committee's concerns to rest.

1. Nature of Contacts with Comsat from 1981 to 1983

Chairman Scheuer, your letter of April 27, 1983, asked me to testify in four areas. First, you asked that I describe my contacts with Comsat in the period 1981-1983.

I believe it is fair to state (1) that those contacts began while I was still at the Department of Energy, (2) that they never reached the point of actual negotiations for any position of employment, (3) that after my decision to accept the position of Deputy Secretary of Commerce both Comsat and I realized that the prospects of my joining the company were increasingly remote, and (4) that at no time were any issues relating to Landsat or Metsat discussed in the employment context.

A. Dr. Joseph Charyk

I have already advised you in writing of the dates on which I spoke with Dr. Joseph Charyk, President of Comsat, about his company's executive needs. Those dates show that three of our four meetings took place before my nomination to be Deputy Secretary of Commerce and before I was aware in any way of the commercialization issue.

I learned that Dr. Charyk was interested in finding a person who could succeed him as Comsat's president. In our four meetings we discussed in broad terms the new directions Dr. Charyk envisioned for Comsat, and I shared my views on his plans. We also discussed the possible timing of my departure from government. Given the uncertainty of my availability, our discussions never reached the point of job negotiations. There were no discussions whatever on the specific executive position, the nature of the duties, salary, benefits, or other terms of employment. In short, our talks can only be described as preliminary, exploratory, and, ultimately, unproductive.

Dr. Charyk and I never discussed the question of sale by the government of the Landsat or Metsat systems. In fact, we only had one meeting --the last one I attended, November 5, 1982 -- at a time when I was at Commerce and had any role in the satellite sale issue. The executive recruiter, Mr. Blair Murphy, through whom I was introduced to Dr. Charyk, was also present at that meeting and before we

even sat down to chat Dr. Charyk and I agreed that we would not discuss any sensitive issues, and we did not.

When I was in business, I frequently met and discussed matters with business executives in other companies, and that is the way we have handled a potential conflict issue -- by identifying it and avoiding it. Since we had not entered upon substantive negotiations and had agreed not to discuss such matters as Landsat and Metsat, I believed that the potential for conflict had been properly avoided.

Finally, with respect to Dr. Charyk, I have already told you of our two social contacts. My wife and I attended a Heart Association charity function as guests of Dr. and Mrs. Charyk in November 1982, and he and his wife came to a Christmas open house at my home, attended by over 100 people, on December 18, 1982. I repeat, at no time did Dr. Charyk and I discuss Landsat or Metsat.

B. The Executive Recruiter

The most extensive contact I had about employment was with the executive recruiter, R. Blair Murphy of Spencer Stuart & Associates, who first contacted me in March 1982. Over the following year he called me or I called him probably as many as ten times. I raised the commercialization issue with him as an issue pending before the Department that should not be discussed. That would have occurred after June or July 1982, when I first became aware of the issue.

I did not know Mr. Murphy before he called me although I knew of his firm. I met with him, I believe on March 4, 1982, and that led to my first meeting with Dr. Charyk on March 17, 1982. Mr. Murphy was at the March 17 meeting and at my last meeting with Dr. Charyk on November 5, 1982.

After the first two meetings with Dr. Charyk (March 17 and 23), I was offered the position as Deputy Secretary of Commerce and decided to accept it. Sometime in April 1982, I told Mr. Murphy that I was going to Commerce and that I was looking forward to the new position. Thereafter, two courtesy lunches with Dr. Charyk set for April 7 and April 20 were cancelled. It was not until May 5, 1982, that we finally did have lunch, and I told Dr. Charyk personally that my name would definitely be submitted to the Senate and that I should not be considered a current candidate for any executive position at Comsat.

Mr. Murphy called me again in June. I told him I liked the job at Commerce, that I was deeply involved at that time in the budget process, and that I would not consider leaving government until at least October 1. We spoke again on September 17, 1982. I told him then that I would be busy at least until after the mid-term elections so that I was not considering leaving government in the near future. He urged me at least to have lunch with Dr. Charyk again after the elections and I agreed to do so. That was a mistake.

At our meeting on November 5, 1982, Dr. Charyk concluded, in substance, that if I had an interest in Comsat when I left the government, I should contact them at that time; that their Board had not decided whether it would find its candidate inside or outside the company; and that if they went outside they would be looking at a number of potential candidates.

From then until March 28, 1983, when I received the letter I have already given to the Committee, I probably talked with Mr. Murphy three or four times. My notion then was to return to the private sector around mid-year 1983. We discussed many different things in those conversations, including the state of the economy, whether the recession was over, and the business performance of various companies. We also discussed matters concerning Comsat -- its future direction, its built-in bureaucracy, and whether the Board would be wise to go inside or outside for future leadership. It may well be that Mr. Murphy interpreted my comments as an expression of continuing interest in a position at Comsat, but I did not intend them so. In fact, my wife and I had earlier decided that Comsat was not the right situation for us. Rather, I viewed Mr. Murphy as a talented recruiter who still had an interest in brokering the Comsat position, while my interest was more in maintaining long-range contact with a highly successful executive placement firm which might be of assistance to me when I ultimately left the government.

C. James Lynn, Esquire

My contacts with James Lynn, whom I knew to be an attorney and lobbyist for Comsat, were both business and social, in person and on the telephone. The social contacts were a lunch at Jean Pierre's Restaurant in Washington in September 1982 where he talked about his days as Deputy Secretary of Commerce and the Christmas open house at my home in 1982 where we exchanged only social greetings.

I had two meetings with Mr. Lynn on the commercialization issue. The first was at the Department of Commerce on July 29, 1982. Michael Bayer and I were present from the Department together with, I believe, John Byrne of NOAA. Mr. Lynn and two or three others whose names I do not recall attended for Comsat. At that meeting Mr. Lynn urged Comsat's position that the joint sale of Landsat and Metsat should be considered and the planned Request for Information (R.F.I.) should go out as soon as possible. Some reference to Comsat's "Earthstar" program was made. I listened to the presentation and made no commitments on the part of the Department.

The second meeting with Mr. Lynn and Mr. Bayer on November 30, 1982, was much shorter. As I recall it, I was called out of the meeting by Secretary Baldrige on another matter shortly after it began and did not return. I am sure that Mr. Lynn was there to urge Comsat's points of view, and to provide Comsat's answers to any questions which we might have about the commercialization issues.

I have also talked with Mr. Lynn over the telephone a number of times since we met nine months ago, but I cannot tell you the dates. My best estimate is about a half dozen calls. I do not maintain a telephone log of incoming or outgoing calls, and the record of long-distance calls from my phones has already been provided to the staff as requested by Congressman Scheuer. I know that some of the calls were around the time of the Cabinet Council meeting of December 15, 1982, at which the commercialization question was addressed, but I cannot recollect any specific issue we discussed. It is also likely that there were telephone contacts with someone in my office prior to our three appointments.

I should state unequivocally that Mr. Lynn and I never talked about employment opportunities at Comsat and as far as I am aware he never even knew that I had talked with Dr. Charyk about that matter. Mr. Lynn was an advocate for his client's points of view and was always regarded that way. He was also knowledgeable about the issues and naturally interested in trying to make us see things his client's way. His conduct at all times was professional and above reproach and, as I stated before, we never discussed employment.

2. The Recusal Decision

Chairman Scheuer, the second question in your letter of April 27 asked that I describe my decision to

recuse myself from further involvement in the commercialization issue. As I will describe later in my statement, my involvement in that issue was a limited one.

In late March of this year I learned that Secretary Baldrige had been invited to appear before these Subcommittees to explain the President's decision on the Landsat-Metsat matters and to answer the questions of the Members. I told the Secretary about my contacts with Comsat in case any question concerning my discussions with Comsat were to come up at the hearing. He, of course, already knew that my involvement in moving the Landsat-Metsat issue through the Department of Commerce to his desk and then on to the Cabinet Council was mainly as an expediter and organizer and that I was not involved in policy on that issue.

After I told the Secretary of the discussions with Comsat, he consulted Sherman Unger, the General Counsel of the Department. In early April Mr. Unger recommended that I recuse myself to avoid the potential appearance of impropriety, even though the contacts with Comsat were in the past and the matter closed.

In sum, I did not recuse myself because I had done anything improper. I recused myself because I agreed with Secretary Baldrige and General Counsel Unger that, in retrospect, the continuation of even general discussions with Comsat after I became involved in any way with the commercialization question was unwise, could be misconstrued, and could present an appearance of potential impropriety. The

policy questions implicated by the commercialization proposal are highly significant and bear upon both the level of our continued national participation in space-based research and our ability to compete in the future with other countries in this rapidly developing and vital field of technology. It is my earnest desire that the Congress and the Administration engage in a productive dialogue on the merits of these issues. It is also important that attention not be diverted from the merits of decisions yet to be made by a tangential discussion of whether a preliminary step in the process was somehow tainted by my contacts with representatives of Comsat.

3. My Role In The Commercialization Issue

Your third question, Chairman Scheuer, concerned my personal role in the commercialization issue. I was not at Commerce when the matter was considered at the first three meetings of the Cabinet Council on Commerce and Trade; my first involvement was in June 1982, when the Secretary introduced me to the problem. My role is best described as a limited one. As Deputy Secretary, I was responsible to see that the various studies underway both inside and outside the Department of Commerce were completed in a timely fashion, so that the basic policy issues could be presented to and decided by the Secretary, the Cabinet Council, and ultimately the President and the Congress.

I saw my role essentially as that of an an expediter. I neither conducted the underlying studies nor made policy decisions as to the ultimate course to take. Secretary Baldrige accurately described my role in testimony at your April 14, 1983 hearing, when he said that I, like my predecessor as Deputy, function as a day-to-day manager, pushing Department business along to completion, with the Secretary reserving policy decisions to himself.

I assigned the primary duty for expediting the study process to Associate Deputy Secretary Michael Bayer. Mr. Bayer's charter was to monitor the work of the required study groups and, working with NOAA, to assemble a proposal for eventual presentation to the Secretary. I retained ultimate responsibility for that task, and from time to time at Mr. Bayer's request I met with him and other persons within the Department to deliver the message that timetables must be met.

Aside from such meetings, I can recall three occasions when I had some personal involvement in the process. One occurred on December 10, 1982, when the package was presented to me for clearance before the Secretary's briefing. One of the issues for decision by the Secretary was whether, assuming a sale, there should be a time-phased transfer of components of Landsat and Metsat or whether each system should be sold at one time. The recommendation in the package as brought to me was that sale of the entire system should occur at one time.

I decided that both alternatives should be presented to the Secretary so as to preserve for him the policy-making prerogative, and both options were, in fact, presented to him. One could argue that presenting the component sale option was an anti-Comsat decision on my part, but I did not see the issue in those terms. To me, it was simply a matter, consistent with my managerial role, of preserving the policy options for the Secretary.

There were two other instances where I remember having some personal involvement in the proposal process. The first dealt with the preamble to the R.F.I. and the second with how to deal with the national security concerns of the Department of Defense and others. I shall turn first to my part in the preamble issue.

At the outset I want to say that I have read the questions which were put to the Secretary about my supposed personal contact with drafting, lifting, or editing the preamble. I did none of those things. Nor did I ever read the so-called "Earthstar Update" of Comsat, language from which appeared, I now understand, in the early part of the chain of drafts and redrafts of what ultimately became the preamble.

Mr. Bayer has told me that in a conversation with him and Dr. Anthony Calio, Deputy Administrator of NOAA, I cleared the idea of a preamble to the R.F.I. This is possible, but I do not remember the incident. My recollection of when I was first involved in the preamble issue was

when Mr. Bayer, told me that the R.F.I. had been published on September 10, 1982, but that NOAA had inadvertently omitted the preamble. We talked about why a preamble was desirable and he made the point that the preamble was designed to attract attention to the R.F.I. and to encourage the widest possible response from various segments of private industry. The idea of maximizing responses and competition appealed to me and I told him to republish the R.F.I. with the preamble. As I remember it, my decision to republish was also communicated to Dr. Calio.

In short, I believe that the preamble as ultimately published was accurate and served its purpose of attracting attention to the R.F.I. If the idea or some of its language was borrowed from a Comsat document I was not aware of it at the time.

The only other personal involvement I had in the progress of the commercialization issue in Commerce was my communication in December 1982 with Frank Carlucci, who at the time was Deputy Secretary of Defense. I asked him to consult with persons who had an interest in the national security aspects of commercialization and to write a letter in which these issues were identified.

Mr. Carlucci sent such a letter to Secretary Baldrige, and at the meeting of the Cabinet Council on December 15, 1982, the national security issues were addressed. The plan for dealing with those issues appeared to be acceptable to the members of the Council since the

recommendation which arose from that meeting was unanimous (including DOD).

After the Cabinet Council decision had been made, the Commerce Department began to set up machinery to move the program to the next plateau if and when the President approved the recommendation. Legislation needed to be drafted for submission to Congress, a Request for Proposals (R.F.P.) needed to be drafted, and technical and consultative committees had to be formed to implement the President's decision. The implementation team included a source review board chaired by a person from the National Bureau of Standards and with procurement, legislative, and technical groups. The team also included a governmental interagency group, headed by Dr. Calio, to continue study of security and other interagency issues. Since Mr. Bayer had shepharded the proposal through Commerce prior to the Cabinet Council meeting, he was given the task of continuing this function during implementation and to report to me.

4. The Cabinet Council Decision

Finally, Chairman Scheuer, your letter asked me to address the events which led the Cabinet Council to conclude at its December 15, 1982 meeting that the objections to commercialization raised at its April 20, 1982 meeting had been met. Secretary Baldrige testified fully on this subject at your April 14, 1983 hearing, and I have little personal knowledge to add to his statement.

I was still with the Department of Energy on April 20, 1982, and was not privy to the Cabinet Council's deliberations at that meeting. My first involvement in or knowledge of the commercialization issue came in June 1982. By that time the Secretary had requested the appropriate defense and intelligence agencies to continue exploring national security concerns involving Metsat while NOAA further developed the economic feasibility and other issues through an R.F.I. and various study groups. This dual process was ongoing when I became Deputy Secretary. As I pre- previously testified, it became my role to expedite this study process to a point where the Secretary could make recommendations and the Cabinet Council could reach its decisions.

On December 15, 1982, Dr. John McElroy, head of satellite activities within NOAA, presented the Department's recommendations to the Cabinet Council with Secretary Baldrige presiding. National security issues were addressed both by Dr. McElroy and the representatives from Defense and Central Intelligence. I can only state that the Cabinet Council concluded, unanimously, that security concerns had been sufficiently addressed on the Metsat issue to permit the process to move to the next step. This step -- a dual process of an R.F.P. to see if the private sector could adequately deal with the security issues and the drafting of legislation by the Congress -- is, of course, ongoing.

In conclusion, Mr. Chairman and Members of the Subcommittees, there has been no impropriety in my dealings with Comsat, either on the matter of possible employment or on the satellite sale proposal. My undivided loyalty has been to my employer, the United States; I did not try to sell that loyalty nor did any person associated with Comsat seek to buy it. I honestly thought I had provided for and taken care of the potential for conflict by bringing it to the front and agreeing not to discuss any sensitive matter in my meeting with Dr. Charyk. Obviously, I was not careful enough, because I did not avoid the potential for an appearance of conflict. But no official action of mine was guided, motivated, or tainted by my discussions with Dr. Charyk concerning possible employment.

Attachment F

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

MAY 5 1982

RECEIVED
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NOAA
EXECUTIVE
SECRETARIAT

MEMORANDUM FOR: Malcolm Baldrige, Secretary of Commerce
Edwin Harper, Assistant to the President
for Policy Development

FROM: Annelise Anderson /s/ A. G. Anderson
Associate Director for
Economics and Government

SUBJECT: Cabinet Council on Commerce and Trade (CCCT) Meeting--Land Remote Sensing Satellite (LANDSAT) and Civil Meteorological Satellites (METSATS)

The following is my understanding of the decisions made by the CCCT on April 20, 1982, concerning the commercialization of METSATS and LANDSAT and suggested next steps.

METSATS: Ownership and management of the civil METSATS by the private sector will not be pursued (i.e., continue the present method of operation).

LANDSAT:

1. As a matter of policy, the Federal Government will not make any commitment to provide LANDSAT data continuity beyond the already budgeted LANDSAT D and D' satellites; nor will the Government commit to any subsidies/guarantees to assure private sector's willingness to invest in and operate a LANDSAT-type satellite system. (Implicit in above is that the Federal Government will not build another LANDSAT-type satellite beyond LANDSAT D') However, the Federal Government will pursue ownership and management of LANDSAT D and D' by the private sector. (Department of Commerce will take lead)

2. The possibility of an international partnership with Japan and/or a consortium of European nations will be explored. (OSTP will take lead)

3. The possibilities for obtaining multi-spectral data in the late 1980's through a far more economical means (e.g., adding sensors to other platforms) will be explored. (NASA will take lead)

We believe that the U.S. private sector will only come forward if it is assured that the U.S. Government will provide direction and promote competition. Thus, the exploration of international cooperation and more economical NASA sensors must be pursued in a manner that does not diminish this assurance or otherwise pre-empt U.S. private sector involvement.

As an immediate next step, DOC should submit to OMB before May 15, draft amendments to the pending LANDSAT bill that would allow transfer of LANDSAT assets and would provide a minimum regulatory framework necessary to protect national security and international concerns. This would allow potential investors to evaluate the ground rules under which they would have to operate.

cc: Dr. George Keyworth
Mr. Windell Gunn
Dr. John Byrne

Attachment G

UNITED STATES DEPARTMENT OF [illegible]
National Oceanic and Atmospheric [illegible]
Washington, D.C. 20230

THE ADMINISTRATOR

May 7, 1982

MEMORANDUM FOR: Annelise Anderson
Associate Director for
Economics and Government
Office of Management and Budget

FROM: John V. Byrne

SUBJECT: Cabinet Council on Commerce and Trade (CCCT) Meeting of April 20, 1982, Re: Satellites

Your memorandum of May 5, 1982, includes impressions which I believe are incorrect. The impressions which I believe are incorrect pertain to the section on LANDSAT. The section on METSATS reflects my recollection of the activities of the meeting.

LANDSAT:

I do not remember that the Cabinet Council took a position at the April 20 meeting either for or against the continuation of LANDSATs D and D'. The recommendation made by Dr. George Keyworth was that NOAA should look into the feasibility of continuing to obtain the kind of data provided by LANDSAT D. Subsequent to the meeting, Dr. Keyworth made it clear that he was concerned with continuation of the remote sensing capability and was not specifically concerned with the continuation of the LANDSAT D satellite series. He recommended that NOAA consider other opportunities to provide the same type of multi-spectral scanning capability which presently exists on LANDSAT D so there would be no interruption to the provision of such data.

The Office of Science and Technology Policy will look into the possibility of an international partnership with Japan and/or other countries for the continuation of land remote sensing capabilities.

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The possibilities for obtaining multi-spectral data following the demise of the LANDSAT D satellite should be explored. NOAA, not NASA, was asked to take the lead on this. Dr. Keyworth requested that the Office of Management and Budget investigate the cost involved with the "privatization" of the transfer of land remote sensing to the private sector. There was no suggestion that a specific "A-76" study be undertaken by OMB, but rather that they explore the general matter of the cost involved with the transfer.

Although, I do not believe it was brought up at this particular Cabinet Council meeting, the Department of Commerce should be prepared, through NOAA, to develop drafts to pending LANDSAT legislation that would permit transfer of LANDSAT assets to the private sector. Such legislation should provide the minimum regulatory framework needed to protect national security and international concerns. At the request of Secretary Baldrige, NOAA will be pleased to develop such draft legislation amendments.

Copies to: Secretary Malcolm Baldrige
Edwin Harper
Tom Collamore

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Washington, D.C. 20230

THE ADMINISTRATOR

Attachment H

MAY 20 1982

TO: Malcolm Baldrige
Chairman, Cabinet Council on Commerce and Trade

FROM: John V. Byrne
Chairman, Cabinet Council on Commerce and Trade
Working Group

SUBJECT: Action Item from Meeting with COMSAT

This memorandum responds to an action I agreed to take during my recent meeting with representatives of COMSAT. That meeting is described in the minutes prepared by Mr. Collamore. So that COMSAT can respond, I agreed to prepare a summary of the considerations affecting whether the civil weather satellites should be retained in the public service, and a list of contacts who could provide more detailed information.

In preparing the attached summary, I chose not to address it directly to COMSAT, because you may wish to employ it to solicit inputs from other representatives of private industry. We would, of course, welcome any response to these issues.

Attachments

CONSIDERATIONS FOR OPERATION OF THE METEOROLOGICAL SATELLITES IN THE PUBLIC SERVICE

Issues are addressed below that need to be considered in determining whether the civil meteorological satellites should be transferred to the private sector or retained in the public service.

The broad area of command and control of the civil satellites by DoD is an important consideration. This has three facets: (1) priority service to DoD under either normal circumstances or emergencies (this includes situations that are not publicly-declared national emergencies), (2) denial of civil satellite use to hostile powers (even if that involves destroying the satellites), and (3) transfer of command and control of civil satellites to DoD in emergencies. Although the role of the civil satellites is frequently referred to as that of a backup to the Defense Meteorological Satellite Program (DMSP), the activity is an integral part of DoD weather forecasting and not only a backup. For example, today the civil satellites are the principal source of weather data to the British fleet in the Falklands. Other support involves classified programs, but it should be noted that DoD requirements saturate some satellite modes of operation. A high priority must be placed on those activities and could conflict with the objectives of a commercial venture.

Flexibility and responsiveness must be retained in the complex interrelationships that exist between the defense and civil systems. Satellites are only one element, although an important one, of an overall weather observing and forecasting system. Optimization of that system involves control and modification of criteria for satellite replacement (i.e., what instrument failure, or combination of instrument failures, necessitates satellite replacement), orbital parameters (to fit the needs of synoptic analyses), and satellite instrument complements. The civil and military systems currently share the use of the same polar orbiting satellite design and are implementing interlocked shared data processing systems. The Government must control the above items--particularly such critical parameters as the equator crossing time of a polar orbiting satellite, which could conflict with some aspects of commercial operation.

Continuing long-range research is essential for the improvement of day-to-day operations. The evolution of meteorological sensors is necessary if capabilities in weather forecasting are to advance. Experience suggests that the evolution of new instruments and their integration into defense, civil, and international forecasting regimes is a lengthy complex process. The new geostationary sensor called the "VAS" is being brought currently from experimental development to operational use. The process of scientific research and development of the instrument

and its experimental utilization has gone on for nearly a decade, and several more years will be required before it is routinely used in the National Weather Service. Ongoing research areas that will lead to operational instruments include advanced microwave sounders and coastal zone color scanners. The steps between research and the operational use of new systems involve three distinct phases: (1) the establishment of requirements by operational entities that determine the direction of research and development, (2) an evaluation phase, carried out in the operational environment by the operational people, to assess the utility of the new technique or system, and (3) the decision, based on technical and economic considerations, whether to proceed to full operational deployment. Each phase could produce conflicts with the objectives of a commercial venture.

Finally, commercialization of the weather satellites as perceived could necessitate the formulation of a complex regulatory regime to protect the Government's interests in weather services. The constraints that would be imposed by defense, civil, and international considerations might create a captive entity with no flexibility to act as a private enterprise. It is evident that the factors stated above must be addressed in an overall system and management context, and not by only an enumeration of technical considerations and their proposed solution.

POINTS OF CONTACT
ON CIVIL WEATHER SATELLITE ISSUES

Dr. John H. McElroy
Assistant Administrator for Satellites
National Earth Satellite Service, NOAA
Washington, D. C. 20233
(202) 763-7190

R/Adm. Robert Schmitt
Director for Intelligence and Space Policy
Pentagon, Room 3D239
Washington, D. C. 20301
(202) 697-4436

B/Gen. Clinton Winne, Jr.
Deputy Director
Intelligence Community Staff
1724 F Street, N.W.
Washington, D. C. 20505
(202) 376-5608

Col. Vernon Malahy
Chairman, Joint Environmental Satellite
Coordinating Group
OUSDRE/C&SS
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Assistant Director
Office of Science & Technology Policy
Executive Office of the President
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Fleet Numerical Oceanographic Center
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Dr. William D. Bonner
Director, National Meteorological
Center
National Weather Service, NOAA
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(301) 763-8016

L/Col. Gilbert Rye
National Security Council Staff
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Washington, D. C. 20500
(202) 395-5022

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Washington, D.C. 20230

THE ADMINISTRATOR

Attachment I

June 3, 1982

Mr. James T. Lynn
Jones, Day, Reavis & Pogue
1735 Eye Street, N.W.
Washington, D.C. 20006

Dear Jim,

The paper we promised you concerning issues to be addressed regarding the transfer of Meteorological Satellites is enclosed. I am also including a list of appropriate people to contact within the Government for information.

I know that as a result of COMSAT's interest, your response will be timely. Please call me if you have questions.

Sincerely,

John V. Byrne

Enclosure

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CONSIDERATIONS FOR OPERATION OF THE METEOROLOGICAL SATELLITES IN THE PUBLIC SERVICE

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ON CIVIL WEATHER SATELLITE ISSUES

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17th & Pennsylvania Avenue, N.W.
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and Proposed Revisions 7/22/82

REVIEW COPY

Attachment J

COMMERCE BUSINESS DAILY ANNOUNCEMENT

CIVIL OPERATIONAL REMOTE SENSING FROM SPACE

Secretary of Commerce
The ~~President's Cabinet Council on Commerce and Trade (CCCT)~~ is examining two issues with regard to the nation's civil remote sensing satellites:

1. What is the best mechanism to implement the current policy of transfer of civil land remote sensing systems (LANDSAT) to the private sector as soon as possible?

2. Should the Administration consider simultaneously private sector transfer of both civil weather and land remote sensing systems?

e Admini- / ration / d its

Secretary of Commerce is requesting
To assist in the process, the ~~Chairman of the CCCT has requested~~ that the views of private industry be obtained. These views will be analyzed by an advisory committee ~~on commercialization appointed by the Secretary of Commerce, who also chairs the CCCT~~. This committee includes private sector representatives. ~~The views will also be analyzed by a governmental working group of the CCCT.~~

l or / rt of / e information / ovided / ll / eated / pro- / rietory / ere / quested / the / spon- / nt.

and the mechanism(s) for transfer of these systems to the private sector.
Private sector representatives are invited to present their views and expressions of interest on ownership and/or operation of the land and weather satellites and the likelihood of Government savings in either mode. The response may include both, either, or any part of either system. ~~Submissions may consist of comments on the feasibility or advisability of various types of transfer, or they may consist of explicit expressions of interest in particular transfers on behalf of their organization. In the latter instance, The desired information includes:~~ The desired information should include:

1. A statement of the recommendations and rationale for transfer of all or any part of ~~the civil remote sensing~~ these satellite systems.

2. A discussion of the technical and business aspects of any proposed transfer, with particular emphasis on continuity of service and the cost savings to the Government.

3. A description of the terms and conditions that are necessary for a successful transfer. ~~Included should be:~~ This should include, but is not limited to:

~~a. Any incentives or guarantees required from the Government.~~

a. b. Any desirable or undesirable Government regulation.

~~c. Any need to create a sole or designated entity.~~

b. Any need for legislation.

THE SECRETARY OF COMMERCE
Washington, D.C. 20230

Attachment K

11 AUG 1982

Mr. Joseph V. Charyk
President and Chief Executive Officer
Communications Satellite Corporation
950 L'Enfant Plaza, S.W.
Washington, D.C. 20024

Dear Mr. Charyk:

Thank you for your letter regarding commercialization of Federal civil remote sensing satellites. Mr. Guy Fiske, Deputy Secretary of Commerce, has had in-depth discussions with Jim Lynn and other representatives of your organization regarding COMSAT's role in possible commercialization of satellite operations. The procedures we are following have been explained to Mr. Lynn and the others. I assure you that we will follow these procedures as expeditiously as possible.

Your response will be carefully examined in our overall solicitation and review of industry views. We expect to release soon a request in the Commerce Business Daily for more detailed information. We invite you to compare that request with the material you have already submitted to be sure that the evaluation groups have the benefit of all your thoughts.

Sincerely,

Malcolm Baldrige

Secretary of Commerce

Attachment L

Form CD-183
U.S. DEPARTMENT OF COMMERCE

ABSTRACT OF SECRETARIAL CORRESPONDENCE

TO: X The Secretary | The Deputy Secretary

Date: AUG 30 1992

DECISION MEMORANDUM

From: John V. Byrne
Administrator, NOAA

Prepared by: John H. McElroy, NOAA/NESS, 763-7190

Subject: Commerce Business Daily Announcement for Civil Operational Remote Sensing from Space

The Land Remote Sensing Satellite Advisory Committee (Committee) would like your approval to solicit formally information from potential private sector participants in commercialization of the land and/or weather satellites. This recommendation is incorporated in the resolutions passed by the Committee and is consistent with the approved charter for the Committee.

We concur in this recommendation and have, therefore, prepared a draft Request for Information to be published in the Commerce Business Daily (CBD). It has been reviewed and approved by the Interagency Program Board, which has representatives from all concerned Federal agencies. The draft announcement is attached. Dr. Anderson of OMB requested that their comments on the draft (also attached) be brought to your attention. She stated that, while they would have preferred a firm Request for Proposals on Landsat, they accept this step, but would want to discuss any deviation from the attached text with you personally. The Program Board requested one deviation from the Committee's recommendation--a reduction in the response time permitted to industry from 90 days to 45 days; this has been accepted and coordinated with the Committee chairman.

The schedule of events is as follows:

1. Seven days after your approval, the CBD notice will appear.
2. Forty-five days later, industry responses are due. SEP 9 1992

Control No. 210614

	PREPARED BY	CLEARED BY	CLEARED BY	CLEARED BY	CLEARED BY	CLEARED BY
SURNAME AND ORGANIZATION (Typed)		[illegible]	D/S	[illegible]	[illegible]	
INITIALS AND DATE		9/1	8/31	8/31	8/1	

USCOMM-DC 1030-P90

3. Two weeks after receipt of responses, the initial evaluation will be completed.

4. The results of the initial evaluation will be presented to the Committee and you as quickly after the evaluation period as your schedule permits.

5. The next CCCT meeting can be scheduled anytime after you are satisfied with the results of the evaluation.

DECISION SEP 2 1982

Approve ✓ Disapprove _____ Let's Discuss _____

Attachments

Fiske
Addition to RFI

9/3/82
Communicated to NESS on 9/7/82 verb. by Dr. Calio a. in writing on 9/8/82

COMMERCE BUSINESS DAILY ANNOUNCEMENT

CIVIL OPERATIONAL REMOTE SENSING FROM SPACE

PREAMBLE

It is the policy of this Administration to seek commercialization of Governmental activities which are not uniquely Governmental in nature since private enterprise is the primary source of our national economic strength. (A)

The United States Government currently operates civil satellite systems to collect and disseminate remotely sensed weather and land satellite data. (B) This data is used by numerous departments and agencies to perform Government services and is used by the private sector to extract information valuable in that sector. Civil satellite remote sensing is an activity which has a potential for substantially greater commercialization. Private entities have expressed interest in providing the remotely sensed satellite data that is needed by the Government and non-Government users on a commercial basis. (C) The Land Remote Sensing Advisory Committee is currently soliciting other expressions of interest from the private sector for ownership and/or operation.

Letters Refer to Attache Excerpt from Comsat Earth Updat

It is the policy of this Administration to seek the promot commercialization of civil weather and land satellite remote sensing, (D) assuming that the responses to the Land Remote Sensing Advisory Committee confirm our present information that commercialization would be economical and in the public interest. Interested commercial firms therefore should submit their proposals to the Land Remote Sensing Advisory Committee.

In returning a call from Paul Maughan of Comsat on 9/7/82, he asked if a policy preamble had been inserted ahead of the text to be published in the RFI. I told him that I knew of no

Excerpt from Comsat's Earthstar Update 3/15/82

decision in favor of such transfer is made, there are matters which will require detailed negotiation with an interested company. We believe such negotiations can and will lead to mutually satisfactory arrangements. For example, national security controls and international distribution of weather data are both important areas for attention in working out the detailed arrangements, but we believe that both of these can be handled by contract to the satisfaction of the Government.

However, absent a policy decision to commercialize, it would be very difficult for a company to justify the expense of preparing for and conducting such negotiations. What is required now is a clear policy decision to provide the affirmative signal needed to justify proceeding with negotiations.

V. POLICY STATEMENT

COMSAT urges the Administration to make a policy decision to seek prompt transfer of the civil weather and land remote sensing satellite systems. The Administration should also assign responsibility to carry out the policy and establish a procedure for working out the details and implementing a transfer.

A suggested policy statement setting forth a recommended policy, assignment of responsibility and procedure for implementation is set forth below:

SUGGESTED POLICY STATEMENT

Private enterprise is the primary source of national economic strength. In recognition of this principle, it has been and is the policy of the Government not to compete with private enterprise and to rely on private enterprise to supply the products and services needed by the Government. (A)

Currently, the Government operates several civilian remote sensing satellite systems to collect and disseminate remotely sensed data. (B) However, private companies have expressed interest in providing the remotely sensed satellite data that is needed by the Government and providing data to non-Government customers on a commercial basis. (C)

There do not appear to be any overriding factors requiring continued Government operation of weather and land satellite systems. Furthermore, it appears that the simultaneous transfer to the private sector and combination of the weather and land satellite systems would provide numerous public benefits, including significant cost savings to the Government. Therefore, it is the policy of the Administration to seek prompt transfer to the private sector and combination of the existing Government civilian weather and land remote sensing satellite systems on a basis that would be economical and consistent with the public interest.

(D) Comsat's View - Not consistent w/ th CC positi from Ma and Ap. meeti

The (desi ffice) shall carry out this policy and, within six months of this Statement, shall recommend to the President legislation which will establish the means of transfer to the private sector, the necessary authorizations to effect such a transfer, and such other matters as may be appropriate.

VI. COMSAT IS UNIQUELY QUALIFIED TO BE DESIGNATED

COMSAT believes that it is uniquely qualified to purchase the exisiting Government civil weather and land satellite systems and develop a commercial remote sensing satellite system. COMSAT is experienced in the commercial application of advanced space technology, the successful operation of satellites and the development of new markets. By federal statute, three members of its fifteen member Board of Directors are appointed by the President. COMSAT's stock is widely held, as by statute, no person may own more than 10 percent and aliens may not own more than 20 percent. By statute COMSAT also has special reporting and consulting obligations to the Government. COMSAT has wide experience in dealing with commercial arrangements in an international setting. Further, COMSAT does not build satellites. COMSAT procures satellites from a variety of manufacturers, thereby promoting competition and helping to maintain a diverse technological base and manufacturing capability in the United States.

COMSAT believes that after consideration of all relevant factors, the Administration and Congress will agree that the best course of action will be to enact legislation which would transfer the existing Government civilian weather and land remote sensing satellite systems to COMSAT for development of a combined commercial system.

THIRD REVIEW COPY

COMMERCE BUSINESS DAILY ANNOUNCEMENT

CIVIL OPERATIONAL REMOTE SENSING FROM SPACE

The Secretary of Commerce is examining two issues with regard to the nation's civil remote sensing satellites:

1. What is the best mechanism to implement the current policy of transfer of civil land remote sensing systems (LANDSAT) to the private sector as soon as possible?

2. Should the Administration consider simultaneously private sector transfer of both civil weather and land remote sensing systems? (At this time, Administration policy is that civil weather satellite systems should remain in the Government.)

To assist in the process, the Secretary is requesting that the views of private industry be obtained. These views will be analyzed by the Administration and its advisory committee. This committee includes private sector representatives. Based in part on the results of this process, it is planned that a formal Request for Proposals will be prepared.

Private sector representatives are invited to present their views and expressions of interest on ownership and/or operation of the land and weather satellites and the likelihood of Government savings in either mode and the mechanisms for transfer of these systems to the private sector. All or part of the information provided will be treated as proprietary where requested by the respondent. The response may include both, either, or any part of either system. The desired information includes:

1. A statement of the recommendations and rationale for transfer of all or any part of these satellite systems.

2. A discussion of the technical and business aspects of any proposed transfer, with particular emphasis on continuity of service and the cost savings to the Government.

3. A description of the terms and conditions that are necessary for a successful transfer. This should include, but not necessarily be limited to:

   a. Any desirable or undesirable Government regulation.

   b. Any need for legislation.

   c. Use of Government facilities, ground stations, and equipment.

   d. Services to be provided to the Government and public.

e. Time frame in which transfer is considered feasible.

4. A description of the proposed remote sensing system and its capabilities (area of coverage, spatial resolution, sensor frequency bands, interval between repeat coverages of a ground site, etc.), including plans regarding direct transmission of data to foreign ground stations.

5. Anticipated evolution of new or improved sensing capabilities under the proposed transfer, and recommendations for a means to assure that evolution in any contractual or regulatory vehicle.

6. Response to foreign competition and its effects.

7. Potential for commercial international joint ventures in remote sensing and their implications in the areas of export control and national security.

8. If transfer is recommended for all or part of the civil weather satellite systems, information should be supplied on:

   a. Assumption of command and control by the Department of Defense in emergencies.

   b. Effect of providing selected priority service to defense needs when required.

   c. Feasibility and savings associated with combining weather and land satellite functions (space and/or ground segment), and recommendation.

   d. Use of existing Government facilities, ground stations, and equipment inventory.

   e. Use of existing industry facilities, ground stations, and equipment inventory.

   f. Proposed criteria for launching replacement satellites and selection of orbital parameters.

   g. Weather satellite service costs under the proposed transfer to permit comparisons with current costs.

   h. A statement of the pricing and data distribution practice (domestically and internationally) that would be employed for weather data.

   i. Intended approach to the evolution of sensor systems still in an R&D stage, such as the VAS on the geostationary weather satellites.

j. Approach to be used with foreign-supplied instruments, such as the ARGOS and SSU on the polar-orbiting weather satellites.

k. Approach to response to the National Weather Service priorities for severe storm data (National Severe Storm Forecast Center in Kansas City and National Hurricane Center in Miami).

A briefing package on the civil remote sensing satellites has been prepared and interested parties may obtain it from Mr. Robert L. Birchfield, Chief, Resources and Management Services Group, National Earth Satellite Service/NOAA, Washington, D.C. 20233. His telephone number is (301) 763-2690. A conference will be held for industry on August __, 1982.

Submissions should be directed to Dr. John H. McElroy, Assistant Administrator for Satellites, National Earth Satellite Service/NOAA, Washington, D.C. 20233, and will be considered up to September __, 1982. Dr. McElroy's phone number is (301) 763-7190.

Queries may be addressed to either of the above.

John V. Byrne
Administrator
National Oceanic and Atmospheric Administration

COMMERCE BUSINESS DAILY ANNOUNCEMENT

CIVIL OPERATIONAL REMOTE SENSING FROM SPACE

PREAMBLE

It is the policy of this Administration to seek commercialization of Governmental activities which are not uniquely Governmental in nature since private enterprise is the primary source of our national economic strength.

The United States Government currently operates civil satellite systems to collect and disseminate remotely sensed weather and land satellite data. This data is used by numerous departments and agencies to perform Government services and is used by the private sector to extract information valuable in that sector. Civil satellite remote sensing is an activity which has a potential for substantially greater commercialization. Private entities have expressed interest in providing the remotely sensed satellite data that is needed by the Government and non-Government users on a commercial basis. The Land Remote Sensing Advisory Committee is currently soliciting other expressions of interest from the private sector for ownership and/or operation.

It is the policy of this Administration to seek the prompt commercialization of civil weather and land satellite remote sensing, assuming that the responses to the Land Remote Sensing Advisory Committee confirm our present information that commercialization would be economical and in the public interest. Interested commercial firms therefore should submit their proposals to the Land Remote Sensing Advisory Committee.

COMMERCE BUSINESS DAILY ANNOUNCEMENT

CIVIL OPERATIONAL REMOTE SENSING FROM SPACE

PREAMBLE

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COMMERCE BUSINESS DAILY ANNOUNCEMENT

CIVIL OPERATIONAL REMOTE SENSING FROM SPACE

9/8/82 Version – NESS Recommended Changes

PREAMBLE

It is the policy of this Administration to seek commercialization of Governmental activities which are not uniquely Governmental in nature since private enterprise is the primary source of our national economic strength.

The United States Government currently operates civil satellite systems to collect and disseminate remotely sensed weather and land satellite data. This data is used by numerous departments and agencies to perform Government services and is used by the private sector to extract information valuable in that sector. Civil satellite remote sensing is an activity which has a potential for substantially greater private sector involvement. ~~commercialization.~~ Private entities have expressed interest in providing the remotely sensed satellite data that is needed by the Government and non-Government users on a commercial basis. ~~The Land Remote Sensing Advisory Committee is currently soliciting other expressions of interest from the private sector for ownership and/or operatio~~.

~~It is the policy of this Administration to seek the prompt commercialization of civil weather and land satellite remote sensing, assuming that the responses to the Land Remote Sensing Advisory Committee confirm our present information that commercialization would be economical and in the public interest. Interested commercial firms therefore should submit their proposals to the Land Remote Sensing Advisory Committee.~~

Alternative Text Starting with Line 15:

While it is the current policy of the Administration to seek prompt commercialization of land satellite remote sensing and retain the civil weather satellites in the Government, that policy will be reexamined if commercialization of both systems is shown to produce cost savings to Federal agencies and questions relating to national security and foreign relations are resolved satisfactorily.

EXPLANATION OF CHANGES TO PREAMBLE

Page 1

Line 10 - The phrase "greater commercialization" implies an existing commercialization which is not present. Suggest replacement of "greater commercialization" with "private sector involvement." This includes changing from 85% contracting-out as at present (not normally characterized as commercialization) to full commercialization.

Line 12 - The deletion of the last sentence is recommended because it differs from the evaluation process that will be followed. All information supplied by the private sector is delivered to the Government as noted by the RFI. If any company stipulates that all or part of its submission is to be used by the Government only and not shared with the advisory committee--this has already occurred once--the protected portion will be separated at that point. The responses to the RFI will then be distributed to two groups. First, all material that has not been submitted for Government use only will be provided immediately to the evaluation subcommittee which has been appointed by Mr. Halbouty. Second, a Government committee made up from all key agencies participating in the Landsat Program Board and the CCCT will be formed into a structure analogous to that of a Source Evaluation Board (SEB)--the normal structure for the evaluation of major procurement actions. The SEB will have two parts: a Technical Advisory Committee (TAC) and a Business Advisory Committee (BAC). The results of this group's activities will be available to the Secretary and Deputy Secretary at the same time that the Halbouty committee completes the review and approval of its evaluation subcommittee's results.

Page 2

Line 15 - This sentence has been modified to reflect the current status of the CCCT deliberations and to make it consistent with the text of the RFI.

Line 19 - This sentence was deleted to be consistent with the discussion concerning line 12 above.

COMMERCE BUSINESS DAILY ANNOUNCEMENT

CIVIL OPERATIONAL REMOTE SENSING FROM SPACE

9/9/82
Fiske
Response
to NESS
Recommendat.

PREAMBLE

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The United States Government currently operates civil satellite systems to collect and disseminate remotely sensed weather and land satellite data. This data is used by numerous departments and agencies to perform Government services and is used by the private sector to extract information valuable in that sector. Civil satellite remote sensing is an activity which has a potential for substantially greater private sector involvement.

stet ~~commercialization.~~ Private entities have expressed interest in providing the remotely sensed satellite data that is needed by the Government and non-Government users on a commercial basis. ~~The Land Remote Sensing Advisory Committee is currently soliciting other expressions of interest from the private sector for ownership and/or operation.~~

stet

~~It is the policy of this Administration to seek the prompt commercialization of civil weather and land satellite remote sensing, assuming that the responses to the Land Remote Sensing Advisory Committee confirm our present information that commercialization would be economical and in the public interest. Interested commercial firms therefore should submit their proposals to the Land Remote Sensing Advisory Committee.~~

Alternative Text Starting with Line 15:

While it is the current policy of the Administration to seek prompt commercialization of land satellite remote sensing and to retain the civil weather satellites in the Government, that policy will be reexamined if commercialization of both systems is shown to produce cost savings to Federal agencies ~~and questions relating to national security and foreign relations are resolved satisfactorily.~~

18th & 19th

- Amend by adding Preamble
- Evaluation Process – no chairs from within NOAA – DOD or NASA

EXPLANATION OF CHANGES TO PREAMBLE

Page 1

Line 10 - The phrase "greater commercialization" implies an existing commercialization which is not present. Suggest replacement of "greater commercialization" with "private sector involvement." This includes changing from 85% contracting-out as at present (not normally characterized as commercialization) to full commercialization.

Line 12 - The deletion of the last sentence is recommended because it differs from the evaluation process that will be followed. All information supplied by the private sector is delivered to the Government as noted by the RFI. If any company stipulates that all or part of its submission is to be used by the Government only and not shared with the advisory committee--this has already occurred once--the protected portion will be separated at that point. The responses to the RFI will then be distributed to two groups. First, all material that has not been submitted for Government use only will be provided immediately to the evaluation subcommittee which has been appointed by Mr. Halbouty. Second, a Government committee made up from all key agencies participating in the Landsat Program Board and the CCCT will be formed into a structure analogous to that of a Source Evaluation Board (SEB)--the normal structure for the evaluation of major procurement actions. The SEB will have two parts: a Technical Advisory Committee (TAC) and a Business Advisory Committee (BAC). The results of this group's activities will be available to the Secretary and Deputy Secretary at the same time that the Halbouty committee completes the review and approval of its evaluation subcommittee's results.

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Line 19 - This sentence was deleted to be consistent with the discussion concerning line 12 above.

DATE: September 3, 1982

TO: U.S. Department of Commerce
Office of Field Operations
Commerce Business Daily Section
PO Box 5999
Chicago, Illinois 60680

Transmittal No: 1298

US Department of Commerce, NOAA/National Earth Satellite Service, Washington, D.C. 20233

M--CIVIL OPERATIONAL REMOTE SENSING FROM SPACE

The Secretary of Commerce is examining two issues with regard to the nation's civil remote sensing satellites:

1. What is the best mechanism to implement the current policy of transfer of civil land remote sensing systems (LANDSAT) to the private sector as soon as possible?
2. Should the Administration consider simultaneously private sector transfer of both civil weather and land remote sensing systems? (At this time, Administration policy is that civil weather satellite systems should remain in the Government.)

To assist in the process, the Secretary is requesting that the views of private industry be obtained. These views will be analyzed by the Administration and its advisory committee. This committee includes private sector representatives. Based in part on the results of this process, it is planned that a formal Request for Proposals will be prepared.

Private sector representatives are invited to present their views and expressions of interest on ownership and/or operation of

the land and weather satellites and the likelihood of Government savings in either mode and the mechanisms for transfer of these systems to the private sector. All or part of the information provided will be treated as confidential to the extent permitted by law. Offerors should clearly mark those pages of their response that contain proprietary information. The response may include both, either, or any part of either system. The desired information includes:

1. A statement of the recommendations and rationale for transfer of all or any part of these satellite systems.
2. A discussion of the technical and business aspects of any proposed transfer, with particular emphasis on continuity of service and the cost savings to the Government.
3. A description of the terms and conditions that are necessary for a successful transfer. This should include, but not necessarily be limited to:
   a. Any desirable or undesirable Government regulation.
   b. Any need for legislation.
   c. Use of Government facilities, ground stations, and equipment.
   d. Services to be provided to the Government and public.
   e. Time frame in which transfer is considered feasible.
4. A description of the proposed remote sensing system and its capabilities (area of coverage, spatial resolution, sensor frequency bands, interval between repeat coverages of a ground site, etc.), including plans regarding direct transmission of data to foreign ground stations and distribution of data to international and domestic customers.

5. Anticipated evolution of new or improved sensing capabilities under the proposed transfer, and recommendations for a means to assure that evolution in any contractual or regulatory vehicle.
6. Response to foreign competition and its effects.
7. Potential for commercial international joint ventures in remote sensing and their implications in the areas of export control and national security.
8. If transfer is recommended for all or part of the civil weather satellite systems, information should be supplied on:
   a. Assumption of command and control by the Department of Defense in emergencies.
   b. Effect of providing selected priority service to defense needs when required.
   c. Feasibility and savings associated with combining weather and land satellite functions (space and/or ground segment), and recommendation.
   d. Use of existing Government facilities, ground stations, and equipment inventory.
   e. Use of existing industry facilities, ground stations, and equipment inventory.
   f. Proposed criteria for launching replacement satellites and selection of orbital parameters.
   g. Weather satellite service costs under the proposed transfer to permit comparisons with current costs.

h. A statement of the pricing and data distribution practice (domestically and internationally) that would be employed for weather data.

i. Intended approach to the evolution of sensor systems still in an R&D stage, such as the VAS on the geostationary weather satellites.

j. Approach to be used with foreign-supplied instruments, such as the ARGOS and SSU on the polar-orbiting weather satellites.

k. Approach to respond to the National Weather Service priorities for severe storm data (National Severe Storms Forecast Center in Kansas City and National Hurricane Center in Miami) and for major forecast operations (National Meteorological Center in Camp Springs, Maryland).

A briefing package on the civil remote sensing satellites has been prepared and interested parties may obtain it from Mr. Robert L. Birchfield, Director of Resources and Management Services, National Earth Satellite Service/NOAA, Washington, D.C. 20233. His telephone number is (301) 763-2690. A conference will be held for industry at 9:30 a.m. on September 17, 1982, in Room 4830 of the Herbert C. Hoover Building (formerly the Commerce Building), 14th & Constitution Avenue, N.W., Washington, D.C. Firms planning to attend the conference should notify Mr. Robert L. Birchfield of their intent and the number of persons attending.

Offerors should submit 25 copies of their response to Dr. John H. McElroy, Assistant Administrator for Satellites, National

Earth Satellite Service/NOAA, Washington, D.C. 20233, no later than October 22, 1982. Dr. McElroy's phone number is (301) 763-5240. This request for information does not commit the Government to pay any costs incurred for the preparation of a response.

Queries may be addressed to either of the above.

This request for information is not subject to the normal clearance functions required in Sec. 3506(c)(5) of P.L. 96-511 (Paperwork Reduction Act).

Ralph P. Conlin
Contracting Officer

Attachment M

SUMMARY OF INPUTS RECEIVED
IN RESPONSE TO RFI

Fifteen responses were received: twelve from private industry, one from an individual, one from a university, and one from a professional society. In the following paragraphs, a brief statement will be made about each submission.

COMSAT Corporation - COMSAT has reiterated its earlier position of requiring both the civil weather and land remote sensing satellites to produce commercial viability. One new ingredient is stated in the cover letter to the proposition: "However, before the Administration selects an entity and presents legislation to Congress, I believe preliminary negotiations should proceed to a point where the Administration and the prospective entity share confidence that a mutually satisfactory contract can be achieved." They quote an estimated annual Government cost for weather data of approximately $220-230 million and an additional $95-100 million for land data. Further, they list a number of conditions for agreement:

- Fifteen-year data purchase guarantee,
- Assurance by the Government of the economic viability of the system during the early years,
- Gradual assumption by the commercial operator of the financial risk,
- Necessary obligational authority and appropriation for full contract amount.

ASTECH Corporation - Plan to launch their own series of civil remote sensing satellites. Propose to take over command and control of the Landsat-4 (and Landsat-D' after it is safely installed in orbit by the Government), but not the data processing facilities that would be the responsibility of another unnamed operator. The ASTECH proposition involves only the provision of unprocessed data streams from the satellite to various ground stations, but with no responsibility for product generation. Thus, both the data processing facilities at Goddard and those at EROS Data Center would be required to produce products. ASTECH has no interest in the civil weather satellites.

Space Services, Inc. - Have corporate plans to launch private civil remote sensing satellites. No interest in purchasing or operating the Landsat system. Oppose formation of a monopoly for Landsat. Advise against including weather satellites in commercialization activities, and concur with current Administration position that weather satellites remain under Government control.

Control Data Corporation - Does not believe market for Landsat data is sufficiently well defined to support a private venture. Recommends a multiyear joint venture between private industry and the Government for only the ground data processing segment. At some later time feasibility of transferring the space segment would be evaluated. The ground data processing system could include weather data.

University of Massachusetts - Propose gradual commercialization with no immediate transition of either land or weather satellites. Propose first establishing privately-funded "User Interface Facilities" to handle user data requests, training, and project consultation. These would be additive to the current system.

Hughes - Hughes does not support commercialization of either the land or civil weather satellites for at least ten years. If the Government proceeds, Hughes proposes the following conditions: (1) Landsat, the polar-orbiting weather satellites, and the geostationary weather satellites should be addressed separately, (2) selection of a vendor should be done competitively, and (3) no monopoly should be created.

General Electric - State that their analysis of commercialization of civil space remote sensing systems has an unacceptably high business risk. Recommend continuation of Landsat in the Government.

RCA - State that Landsat is a candidate for commercialization--however, only with a Government guarantee because of the inadequate market. Recommend that the civil weather satellites remain under Government control. Suggest some leasing options for the weather satellites.

Ocean Routes, Inc. - This firm opposes transfer of the civil weather satellites on the basis of the undesirability of creating a new highly-regulated monopoly. No position is taken on Landsat.

Environmental Satellite Data, Inc. - Propose commercialization of two subsystems within the weather satellite system--the GOES-Tap network and the VISSR Image Registration and Gridding System (VIRGS). No proposition is given on the overall weather satellite system or on Landsat.

Terra-Mar - No specific commercialization proposition is made for commercialization. Caution that the current Landsat-4 may be a hindrance to commercialization and advocate "prudent steps" to gradual transition. Oppose near-term transition of weather satellites.

AIAA - Plan to provide a more complete analysis later. Preliminary input is that transition to the private sector should: "(1) provide adequate incentives, commensurate with assumed risk, (2) be of an evolutionary nature, and (3) retain federal support for research and development of advanced system capabilities."

Autometric, Inc. - Propose a quantitative evaluation of the relative merits of the Landsat-4 Thematic Mapper, the French SPOT HRV sensor, and the Large Format Camera that will be flown on the Space Shuttle. Evaluation is to ascertain the commercial value of the Thematic Mapper data. No commercialization proposition or comments are provided.

Computer Sciences Corporation - No submission for commercialization discussions, but request inclusion in future discussions on the subject.

Dr. Robert Georgevic - Dr. Georgevic, who lists himelf as a university professor but without identifying the affiliation, opposes commercialization in general. No substantive analysis or rationale is given that would warrant further attention.

Attachment N

EVOLUTION OF RECOMMENDATION TO PRESIDENT

Briefing charts are included in DOC documents room for presentations made to Bayer; Fiske and Bayer; and Baldrige, Fiske, and Bayer. These are dated December 6, December 10, and December 13, respectively, and show the development of the DOC presentation to the CCCT on December 15, 1982.

All three individuals evidently played key roles in sorting out four decisions:

- o Should a centralied or decentralized Federal management structure be employed?
- o Should phased or immediate transfer of the satellite systems be sought?
- o Should only one bid be permitted for all assets or should firms be permitted to bid on only a single system (land or weather)?
- o Should bids be sought before or after enabling legislation is passed?

The outcome of the Baldrige, Fiske, Bayer process was to select:

- o Centralized management to simplify interface for private sector
- o Immediate transfer of all systems
- o Allow bids only for the entire package and not for individual systems
- o Seek bids through an RFP issued prior to passage of enabling legislation

Mr. Bayer deleted from the presentations given to Mr. Fiske and Mr. Baldrige the list of requirements demanded by COMSAT. Prior to Bayer's editing the chart stating the conclusions of the Peck/Charles committees showed the following:

- o The one firm advocating prompt commercialization of both the land and weather satellites, COMSAT, requests an extensive series of conditions. (Although not addressed by the committee, it is assumed that all of these are negotiable and the Government would not necessarily have to meet them to reach agreement.) The conditions are:
  - Designated entity status on basis of Request for Information submissions.

- Minimum 15-year guaranteed data purchase ($315 to $330 million per year indexed to inflation) with the entire 15-year purchase backed by Congressional authorization and appropriations.

- Monopoly status for Government purchases of all civil space remote sensing data, with equitable price adjustments for additional or new data. (Presumably this could prohibit the Government from purchasing data from other domestic or foreign sources, even if such data were not available from the designated entity.)

- The economic viability of the commercial system is assured in the early years by the Government.

- Gradual assumption by the commercial operator of the financial risk.

- Incentives to develop the non-Government markets.

- Contract to be on a "Best efforts basis by the system owner/operator."

- Appropriate limitations on liability to Government and third parties.

- Management flexibility to modify and improve system efficiency and operation.

- The required investment and accompanying risk involved in developing a commercial remote sensing satellite system is so large that such an undertaking must be self-supporting and the financing obtainable on a non-recourse, project financing basis.

- Copyright protection.

- Purchase of all Government assets for approximately $250 to $350 million.

After Mr. Bayer's editing, the text became:

o The one firm advocating prompt commercialization of both the land and weather satellites, COMSAT, requests an extensive series of conditions. (Although not addressed by the committee, it is assumed that all of these are negotiable and that the Government would not necessarily have to meet them to reach agreement.)

No documentary support for the underlined parenthetic expression has been found. After the presentation to Fiske and Bayer on December 10, no reference to the "extensive series of conditions"

required by COMSAT appears in the briefing charts for Secretary Baldrige, not in the later presentation to the CCCT or in the decision memorandum to the President. Thus, a significant point concerning the viability of commercialization and a point that might be considered to be critical of the COMSAT proposition did not ge past Mr. Fiske.

THE SECRETARY OF COMMERCE
Washington, D.C. 20230

Attachment O

MEMORANDUM FOR: MEMBERS OF THE CABINET COUNCIL ON COMMERCE AND TRADE (CCCT)

FROM: Malcolm Baldrige, Chairman Pro Tempore
Cabinet Council on Commerce and Trade

SUBJECT: Commercialization of the Civil Space Remote Sensing Systems

I. ISSUE

(1) What is the best mechanism to implement the current policy of transfer of civil land remote sensing systems (Landsat) to the private sector as soon as possible?

(2) Should the Administration consider simultaneously private sector transfer of both civil weather and land satellites?

II. BACKGROUND

The CCCT has met to discuss this issue in December 1981, March 1982, and April 1982. In the April meeting a tentative decision was reached to examine commercialization of the Landsats along three paths (international joint venture, lower cost missions, or privatization). It was also tentatively decided to continue the civil weather satellites under Government control. The first two paths on Landsat have not produced any new information. I have elected not to bring the recommendation to the President pending further information from industry on both the land and civil weather satellites.

Industry inputs, in the form of responses to a Request for Information published in Commerce Business Daily, were received October 22 and have been reviewed by a private sector advisory committee and an ad hoc Governmental team chaired outside the Department of Commerce.

The private sector committee, chaired by Mr. Michel Halbouty, concluded that none of the submissions was satisfactory as stated, a Request for Proposals (RFP) should be released and legislation submitted to transfer either the land or land and weather satellites to the private sector, and an urgent supplemental appropriation be submitted to procure follow-on Landsats. The committee also concluded that a continuing advanced Federal R&D program in remote sensing is essential and recommended a restriction on the extent of responsibility given if a sole entity were selected for the satellite systems.

The Government team analyzed the industry submissions, but did not formulate a plan for commercialization.

In reviewing the industry submissions and the two evaluations, the Department of Commerce found that industry stated that all Government concerns could be satisfied under a contractual relationship and that industry had provided what might be considered an opening position for negotiations. However, all responses had drawbacks as submitted.

III. DISCUSSION

There are no zero cost solutions to maintaining a civil space remote sensing capability. A purchase of Government assets can reduce expenditures for a year or so, but until a market is established Federal support is necessary, and at a level larger than current budget assumptions -- if it is Government policy for civil space remote sensing to continue. This statement is true whether the systems remain in the Government or are transferred to the private sector.

The U.S. Government is currently spending more than $14 billion per year on the civil and national defense space programs. The investment of less than 2.5% of that amount ($350 million in FY 83 dollars, of which approximately half is already devoted to Federal civil space remote sensing programs) can create a new private industry based on remote sensing of the weather, ocean, and land from space.

A finite-duration redirection of this small fraction of the Nation's investment in space will assure the U.S. of a continued leadership role in civil land remote sensing, a stronger weather satellite system, and the evolution of a commercial ocean satellite system. This investment would produce in the foreseeable future a self-supporting commercial venture.

No other civil space effort can contribute so surely to the future economic base of the country, or continue so visibly both the favorable image of the United States as an advocate of the peaceful uses of outer space and as a supporter of the private sector as the appropriate means to advance those uses.

Civil space remote sensing systems are being advanced by France, Japan, the European Space Agency, India, Canada, the Federal Republic of Germany, and the Soviet Union. The United States has created this high technology field, but will now lose its leadership position unless strong action is taken now.

A commercial entity, with adequate early support, can preserve the U.S. position -- with all of the concomitant implications in contributions to economic strength, national security, foreign policy, and the stimulation of a greater private sector role in space.

Although no one submission from private industry satisfies all criteria that the Government would apply, there is sufficient credible evidence that a satisfactory arrangement can be reached with one or more entities in the private sector. There is also sufficient evidence that a contractual arrangement can be reached that will protect satisfactorily all Federal interests (national security, foreign policy, and protection of life and property), and without creating so constraining an environment that no latitude is left for the private entity.

Federal interests require a continuing oversight of any private entity involved in civil space remote sensing, as does the Outer Space Treaty. Consistent with the President's Space Policy, that oversight can be provided by an interagency committee led by the Department of Commerce. Among the committee's tasks would be drafting the RFP and required legislation, coordinating Federal activities, and ensuring that the private entity adheres to national policies. Illustrative of such policies would be non-discriminatory data dissemination and continuing the U.S. participation in the free international exchange of weather data.

Implementing a commercial system involving the large capital expenditures of a satellite system necessitates some form of assured market. Normal business practice employs guaranteed minimum purchase agreements to justify large capital investments. The Government, as the chief customer in the early years, must accept the private firm's needs for such assurances.

IV. OPTIONS

There are two principal options: (1) Transfer to the private sector, via competitive means, the current operational land, civil weather, and future civil ocean satellites. While one RFP would be released for all systems, joint ventures would be permitted to encourage competition. (2) Continue the current budget policy of bringing the land remote sensing systems within the Government to a close by nominally 1988 and retaining the civil weather satellites under Government control.

OPTION 1 - Pros:

1. Maintains a vigorous U.S. program in civil space remote sensing.
2. Demonstrates commitment to the private sector role in space.
3. Creates a new private industry.
4. Reduces the size and scope of Government activities.

Con:

1. Requires a larger Federal commitment to civil space remote sensing than current budget assumptions (nominally $350 million in FY 83 dollars versus approximately $200 million).

OPTION 2 - Pros:

1. Is within current budget.
2. Avoids need to solve foreign policy and national security concerns resulting from private ownership.

Cons:

1. Leaves advanced civil land remote sensing to foreign entities.
2. Does not increase private sector role in space.
3. Reduces neither the size nor scope of Government.

V. RECOMMENDATION

Ask the Department of Commerce to oversee the transfer of the civil operational weather, land, and future ocean satellites to the private sector as soon as possible. The transfer must be carried out consistent with the following principles:

(1) National security and foreign policy concerns must be appropriately addressed.

(2) The transfer should occur under competitive conditions to the maximum extent practical.

(3) The Department of Commerce should establish the interagency coordinating body as soon as pssible.

MINUTES
CABINET COUNCIL ON COMMERCE AND TRADE
Meeting #49, December 15, 1982
8:45 a.m., Roosevelt Room

Attendees: The Vice President, Messrs. Baldrige, Block, Donovan, Hodel, Brock, Feldstein, Wright, Trent, McNamar, McCormack, Rose, Draper, McPherson, Bolton, Fiske, Olmer, Driggs, Dederick, Morris, Harper, Porter, Darman, Garrett, Cicconi, Gunn, Cavaney, McMinn, Garfinkel, and Dr. Anderson, Ms. Dunlop, Ms. Small

Secretary Baldrige, opened the meeting by reviewing the two issues to be considered: (1) What is the best mechanism to implement the decision to transfer civil land remote sensing systems (LANDSAT) to the private sector as soon as possible? (2) Should the Administration consider transferring to the private sector both civil weather and land satellites? Dr. John McElroy, head of the satellite activities within the Department of Commerce, presented an overview of the civil space systems involved in the transfer and the recommendations of the Department of Commerce to the CCCT.

The following points were made in response to questions raised:

- Market analyses indicate that LANDSAT systems can be self-supporting once a market has the opportunity to grow.

- All inputs received during the examination of these issues, regardless of the overall position taken on commercialization, recommended a continuing vigorous federal remote sensing technology development program in both NASA and DoD.

- Bids would be solicited on the land and weather/ocean satellites separately, but with the option permitted for a joint bid to be made on both.

- Maintaining U.S. leadership in civil land remote sensing cannot be accomplished--in the near term--without a larger commitment than the current budget.

- There are no added FY 83 budget requirements. FY 84 additions, if necessary, could be brought to the Budget Review Board. Establishing a private entity and assuring the U.S. of a competitive entry in international civil space remote sensing will require an enhanced budget commitment. The exact federal commitment needed cannot be determined until firm bids have been received. A review will be made when the exact amount of the proposed commitment is known.

- Only superior products produced by superior technology can successfully compete in world markets. The U.S. has the capability to produce both in civil space remote sensing.

- National security concerns necessitate that any selected entity be a domestic U.S. firm.

- The CCCT concensus was that LANDSAT should not be abandoned to foreign exploitation--that to do so would be inconsistent with U.S. economic, trade and national security interests.

- National security and intelligence concerns can be accommodated through appropriate safeguards. DoD and DCI will both participate in drafting the request for proposals, contractual vehicle, and legislation involved in establishing the entity or entities.

- It would be undesirable for the U.S. to cease participating in the international free exchange of weather data. Maintaining this relationship reduces foreign policy concerns under commercialization.

Action Taken

The Cabinet Council agreed to recommend to the President that the Department of Commerce oversee the transfer of the civil operational weather, land, and future ocean satellites to the U.S. domestic private sector as soon as possible. The transfer will be guided by the following principles:

1. National security and foreign policy concerns must be appropriately addressed in preparing legislation, requesting proposals, and overseeing the activities of the private entity or entities. National security concerns necessitate that any selected entity be a domestic U.S. firm.

2. The selection of the private entity should occur under competitive conditions to the maximum extent practical; this should include offering private firms the option of bidding separately for the land or weather/ocean satellite systems or preparing a joint submission for both.

3. The Department of Commerce should establish the interagency coordinating body as soon as possible.

DRAFTED BY John H. McElroy (Phone: 763-7190) 12/16/82
Acting Assistant Administrator
National Environmental Satellite, Data,
and Information Service
National Oceanic and Atmospheric Administration/DOC

Minutes of the

CABINET COUNCIL ON COMMERCE AND TRADE (CCCT)

Meeting on

COMMERCIALIZATION OF CIVIL SPACE REMOTE SENSING

Secretary Baldrige, Chairman of the CCCT, opened the meeting by reviewing the issues that the CCCT was being asked to decide upon during the meeting. Two issues were to be considered:

(1) What is the best mechanism to implement the current policy of transfer of civil land remote sensing systems (Landsat) to the private sector as soon as possible?

(2) Should the Administration consider simultaneously private sector transfer of both civil weather and land satellites?

Secretary Baldrige then asked Dr. John McElroy, head of the satellite activities within the Department of Commerce, to present an overview of the civil space systems involved in the transfer and the recommendations of the Department of Commerce to the CCCT.

In the discussion that followed the presentation, CCCT members raised questions in a number of areas. Among them are:

(1) The extent of market analyses done to date.

(2) What would happen to technology development in a commercial environment?

(3) Provision for competition in any solicitation to private industry.

(4) Level of technology needed to compete internationally.

(5) Required Federal funding.

(6) Competing against subsidized foreign firms.

(7) Could foreign companies compete for the U.S. civil systems?

(8) Continuation of Landsat.

(9) National security and intelligence concerns.

(10) Foreign policy and relations concerns.

A synopsis of the discussion on each of these subjects is given below.

(1) The extent of market analyses done to date.

A question was raised regarding whether thorough market analyses had been done to examine the potential for Landsat data? Limited market analyses have been done which all show positive benefits from a Landsat system. They are not, however, in total agreement because they show more than an order of magnitude difference in the benefits to be realized. They also do not include the mineral exploration industry market. In spite of these deficiencies, there is reason to believe that Landsat systems can be self-supporting once a market has the opportunity to grow. An essential ingredient to that growth is continuity of data availability; the lack of a firm Federal commitment to data continuity has inhibited private and public entities from committing to its use.

(2) What would happen to technology development in a commercial environment?

A question was raised about the relative roles of the Government and private sector in technology development. All inputs

received during the examination of these issues, regardless of the overall position taken on commercialization, recommended a continuing vigorous Federal remote sensing technology development program in both NASA and DOD. No near-term capability exists or will exist in the private sector to carry out such activities. A commercial entity established by the activities considered here would, however, be responsible for all near-term product-related development and all "next-generation" sensor and spacecraft development.

(3) Provision for competition in any solicitation to private industry.

The issue paper distributed in advance of the CCCT meeting, and the overview presentation, presented an option for soliciting proposals for the total land, weather, and ocean satellite systems, as opposed to separate proposals for the land and weather/ocean systems. This raised many questions about whether the potential economy of scale was so evident that it warranted prejudging conclusions or eliminating potentially competitive propositions for system elements. After consideration of all views, it was determined that bids would be solicited on the land and weather/ocean satellites separately, but with the option permitted for a joint bid to be made on both.

(4) Level of technology needed to compete internationally.

Foreign systems, such as the French SPOT system, will deploy advanced civil space sensors in late 1984. The one firm that has discussed developing and launching its own remote sensing satellites plans to fly a sensor no more capable than the multispectral scanner

first flown on Landsat-1 in 1972. It would not be comparable to the Landsat-4 currently in orbit, Landsat-D' to be flown in 1985, and particularly the French SPOT system. If a firm is selected to be the U.S. designee in civil land remote sensing, the selection must assure U.S. leadership. It was suggested that the Halbouty Committee could provide advice on the sensor characteristics needed to meet civil needs and assure U.S. leadership. Securing this level of technology for the U.S. cannot be accomplished--in the near term--without a larger commitment than the current budget.

(5) Required Federal funding.

Concern was raised about FY 83 and FY 84 budget implications, as well as the overall long-term cost of supporting the establishment of a private civil space remote sensing entity or entities. The Department of Commerce has no budget to support transition costs at present. It was concluded that there are no added FY 83 budget requirements. Further, it was concluded that FY 84 additions, if necessary, could be brought to the Budget Review Board. In the longer term it was acknowledged that establishing a private entity and assuring the U.S. of a competitive entry in international civil space remote sensing will require an enhanced budget commitment. On the other hand it was determined that the exact Federal commitment needed cannot be determined until firm bids have been received, and that an open-ended commitment should not be made at this time. A subsequent review will be made when the exact amount of the proposed commitment is known.

(6) Competing against subsidized foreign firms.

The question was raised whether a U.S. firm can ever successfully compete against subsidized foreign industry--based on the

lack of success in other areas. It appears that only superior products produced by superior technology can successfully compete in world markets. The U.S. has the capability to produce both in civil space remote sensing.

(7) Could foreign companies compete for the U.S. civil systems?

Because it was not explicitly stated in the issue paper, the question was raised whether a foreign firm could enter the bidding. It was concluded that national security concerns necessitate that any selected entity be a domestic U.S. firm.

(8) Continuation of Landsat

Concern was expressed that the recommendation presented to the CCCT in effect reinstated the suport to continuation of the Landsat program beyond Landsat-D' that had been withdrawn in previous budget decisions. While this was acknowledged, the CCCT consensus was that Landsat should not be abandoned to foreign exploitation--that it would not be in the national interest from an economic base, balance of trade, or national security point of view. Further, it was stated that the objective of the actions concerning Landsat was private sector transfer to create a new industry, rather than simply to terminate a program.

(9) National security and intelligence concerns.

DCI and DOD have expressed concerns about private sector entries in civil space remote sensing. Review of these concerns leads to the conclusion that they can be accommodated through appropriate safeguards. DOD and DCI will both participate in drafting the request for proposals, contractual vehicle, and legislation involved in establishing the entity or entities. They

will also participate in the interagency coordinating committee, led by the Department of Commerce as stated in the President's Space Policy, that will exercise oversight. A classified letter to the Department of Commerce has been prepared by the Department of Defense outlining their requirements under commercialization.

(10) Foreign policy and relations concerns.

Department of State requested to be included in preparation of the request for proposals and legislation. This will be accomplished through their membership on the interagency coordinating body. The consensus of the CCCT was also that it would be undesirable for the U.S. to cease participating in the international free exchange of weather data. Maintaining this relationship reduces foreign policy concerns under commercialization.

CCCT DECISION RECOMMENDATION

Ask the Department of Commerce to oversee the transfer of the civil operational weather, land, and future ocean satellites to the U.S. domestic private sector as soon as possible. The transfer should be guided by the following principles:

1. National security and foreign policy concerns must be appropriately addressed in preparing legislation, requesting proposals, and overseeing the activities of the private entity or entities.
2. The selection of the private entity should occur under competitive conditions to the maximum extent practical; this should include offering private firms the option of bidding separately

for the land or weather/ocean satellite systems or preparing a joint submission for both.

3. The Department of Commerce should establish the interagency coordinating body as soon as possible.

DRAFT 12/17/82

Attachment P

If the President adopts the Cabinet Council recommendations concerning civil remote sensing satellite policy, the Secretary must develop an implementation plan to:

- solicit proposals in a way that provides both effective competition and latitude for innovation;
- evaluate the proposals in a way that facilitates communication and feedback to identify and assess appropriate commercial terms as early as practicable, and ensures the input of relevant Executive departments and agencies;
- negotiate the actual terms and conditions with the selected entity; and
- prepare legislation as necessary or helpful to complete the early and efficient accomplishment of commercialization.

In developing a methodology and plan to accomplish these tasks, it is essential to avoid the inflexibilities which result from excessive reliance on procurement law precedents. A "request for proposals (RFP)" approach, for example, in which the government identifies in advance the precise configuration of the items or system to be procured, and which relies upon an insulated "evaluation panel" procedure for reviewing proposals, is utterly unworkable, unnecessary and inappropriate in this case.

The commercialization to be achieved here is, to a large extent, without precedent. There are, however, some useful systems acquisition precedents to which the government can look in designing an appropriate privatization and commercialization plan. These include the OMB's rules for Major Systems Acquisitions (Circular No. A-109) and the Energy Department's "program research and development announcement (PRDA)" and "program opportunity notice (PON)" methods for the solicitation of "ideas" and "opportunities . . . to accelerate demonstration of technical, operational, economic and commercial feasibility" of new technologies and systems respectively. (41 CFR Subparts 9-4.57 and 9-4.58). These approaches provide a framework from which the Department of Commerce can select in an honest and defensible way the private entity to accomplish commercialization, and build a flexible, efficient and effective plan to implement the President's decision.

These procurement precedents provide both an intellectual basis and a concrete starting point from which to consider (1) the nature and scope of the solicitation instrument, (2) the membership and responsibilities of the implementation team and the most effective way to accomplish interagency coordination, (3) selection of the "winning" proposal and (4) completion of the implementation plan by negotiating a contract with the selected entity and preparing any necessary legislation.

1. The Solicitation Instrument (Details at Tab A)

Building from the earlier Commerce Business Daily announcement, the solicitation instrument should be cast in terms of general data requirements and basic government objectives, rather than specific design configurations or inflexible requirements. The solicitation instrument or notice of opportunity should be written in a way that provides the program information necessary to enable qualified entities to prepare serious responses, encourages innovative and imaginative thinking on the part of qualified proposers, draws out alternative system design concepts, and establishes incentives for those proposals which appropriately balance economic concerns and the need to maintain world technological leadership with respect to remote sensing systems.

2. The Implementation Team and Interagency Coordination (Details at Tab B)

Building from the "project management" and "project manager" concepts in the cited procurement precedents, the Implementation Team should possess sufficient flexibility and authority vis-a-vis proposers, and appropriate accountability vis-a-vis the other interested government agencies. Ideally, the team should be as small as possible: no more than three officials from the Commerce Department, most likely senior executives from the Secretary's office, the General Counsel's office and NOAA.

The Implementation Team would, as described in Tab B, be the focal point of the effort, coordinating and consulting with an Interagency Group comprised of appropriate senior executives representing the other affected departments and agencies. The objective is to ensure an information flow to and from the Interagency Group and the proposers, while avoiding the burdens and complications that would result if the Interagency Group became directly involved in the evaluation of proposals or in negotiations with any particular proposer.

3. Entity Selection

The Implementation Team would report to the Secretary of Commerce who ~~in consultation with the Cabinet Council on Commerce and Trade~~ others as appropriate will select the entity to accomplish commercialization.

4. Contract Negotiation and Preparation of Implementing Legislation

The Secretary's decision would in turn be carried out by the Implementation Team, which would negotiate an appropriate business arrangement and oversee the legislative effort, working as before in close coordination with the Interagency Group.

TAB A

NOTICE OF OPPORTUNITY

1. Objectives

   a. Commercialization of land, weather and future civil ocean remote sensing satellite systems.

   b. Provide for existing and future data and service requirements of the federal government.

   c. Provide for continued U.S. technical and commercial leadership in satellite remote sensing.

   d. [Otherwise implement the Cabinet Council decision.]

2. Solicit conceptual proposals and statements of qualification from interested companies.

3. Government to select limited number of respondents for full discussion, negotiation, and exchange of information. Final selection will be made on the basis of following criteria:

   a. ability to meet Government data needs

   b. price to the Government of data and services

   c. price to be paid for Government equipment and facilities

   d. [other selection criteria as appropriate]

TAB B

IMPLEMENTATION TEAM

1. Membership -- Three senior Commerce officials

2. Task -- Implement policy of commercialization

   a. Receive and evaluate proposals and qualifications of respondents.

   b. Select respondents with whom to proceed with full discussions and exchanges of information.

   c. Coordinate activities with Interagency Group.

   d. Recommend to Secretary:

      i. selection of entity

      ii. contract principles

      iii. legislation

3. Powers and authorities --

   a. Negotiate, discuss and exchange information with the respondents, including authorizing a systems audit by selected respondents.

   b. Coordinate activities and solicit advice, support and help from members of interagency task force.

   c. Solicit advice, support and help from members of the Land Remote Sensing Advisory Committee.

   d. Keep negotiations and information received from respondents confidential.

   e. Consult with Congressional committees as appropriate.

4. Schedule --

   a. Notice of opportunity to be issued by January 15, 1983.

   b. Responses due [ ].

   c. Selection of proposals for negotiation and opportunity for audit -- [ ].

   d. Recommend legislation and entity -- June 1, 1983.

Attachment Q

Comments re: Draft Report to Congress

General Comments

The document should assume that the President has adopted the recommendation of the Cabinet Council and should therefore explain and support the President's policy to commercialize weather and land civil satellite remote sensing. It should demonstrate how the President's policy will create a new industry in the U.S., benefit the economy, enhance the competitive positions of the U.S. in the world marketplace, maintain U.S. leadership in development and application of space technology and reduce the size and scope of government activities.

Chapter I. Introduction

A. After extensive examination and review by private sector representatives and government agencies, and on the unanimous recommendation of the Cabinet Council on Commerce and Trade, the President adopted a policy to seek the commercialization of civil weather and land remote sensing satellite systems.

B. Operation of civil remote sensing satellites and production of data and services for use by the government and other users can be done more appropriately, efficiently and effectively by the private sector.

C. Commercialization will create a new industry, stimulate technology development by the private sector in response to new market demands, and save the government money.

D. The markets for these services are undeveloped and will remain undeveloped until commercialization takes place.

E. The U.S. faces vigorous foreign competition, and our technological leadership is threatened. Foreign governments and governmental bodies are subsidizing and otherwise encouraging the development of these competing systems. Commercialization is required to effectively compete with foreign commercial systems.

F. Appropriate regulation and control are and will be sufficient to meet present and anticipated national security, foreign policy and public policy requirements.

G. The best approach is to transfer the civil weather and land remote sensing satellites to the U.S. domestic private sector as soon as possible, and under competitive conditions to the maximum extent practicable. Private firms should have the option of bidding for the systems separately or in any combination.

Chapter II. Policy Guidelines on Appropriate Federal and Private Roles

A. Commercialization of satellite operations and production of satellite data is consistent with existing policies of the U.S. Government:

1. Economic Policy - Production of goods and services should be in private sector. Federal government action should be reserved for those needed functions that only the national government can undertake.

2. Commercialization Policy - Government should not compete with its citizens, and goods and services needed by the government should be obtained from the private sector.

3. Space Policy - Government should encourage domestic commercial exploitation of space capabilities, technology and systems for national economic benefit.

4. International Policy - The U.S. must honor all existing international obligations, maintain all national security requirements, and preserve and enhance U.S. leadership in the development and application of new technologies.

B. Applying these policies, the functions which should be retained in the government are:

1. National Weather Services - weather advisories, severe weather watches and warnings.

2. Advanced basic research and development - NASA.

3. Operation of military remote sensing systems - DOD.

4. Authorization and general supervision of civil remote sensing satellite systems - DOC, to fulfill international, national security and foreign policy obligations and requirements.

Chapter III. Steps in the Development of a Private Sector Transfer Policy

A. Summarize background and prior studies and other developments to illustrate the scope and integrity of the process.

B. Advantages of commercialization concepts suggested by the private sector in response to DOC invitations include:

1. Projections of substantial government cost savings.

2. Development of commercial markets and further government savings.

3. Enhanced technology development.

4. Better products and improved services.

5. U.S. ability to meet foreign competition.

C. Recommendations and rationale of the Cabinet Council on Commerce and Trade.

Chapter IV. Overview

A. Identify and describe the equipment, satellites and facilities available for transfer in a way that facilitates transfer and commercialization. In particular, the ability to separate National Weather Service facilities and equipment from other facilities and equipment should be made clear.

B. Transfer can be accomplished without affecting adversely:

1. Existing international agreements, or

2. Required or anticipated data exchanges.

C. Commercialization and private market development would expand the user base.

Chapter V. Factors Applicable to Regulation of Land and Environmental Satellites

A. Describe the detailed consideration given to the national security, foreign policy and other national interest requirements in arriving at the President's policy.

B. These issues and any other concerns can be addressed satisfactorily under:

1. existing government authority and controls (e.g., Presidential authority in national emergencies), and

2. the terms and conditions of a long-term contract between the government and the private entity or entities.

Chapter VI. Data Markets

A. Government ownership and operation of civil remote sensing satellite systems has not resulted in the development of significant non-government markets, nor will (or could) it ever.

B. Although there are substantial commercial risks to the entity or entities involved (as made evident by the willingness of other governments to underwrite, subsidize or otherwise assist competing national systems), there is also a significant market potential to be developed by the private sector once government operations, service schemes, production methods and product mixtures are replaced.

C. Commercial opportunities will result from:

1. The incentive and ability to tailor products quickly to changes in user capability (e.g. rapid advances in minicomputer hardware and software) and to modify or drop expensive inventories of products having limited demand and use;

2. The incentive (and lack of bureaucratic constraints) to develop new products that draw upon multiple sources of information (not only "mission" data bases)--and to shortcut the typical 10 year delay between government R&D projects to "operational" or commercial offerings;

3. The incentive and technical agility to enhance an existing feature of a government system, which has obvious commercial applications (e.g. the data relay capability of GOES Next);

4. The commercial self-interest in promoting the analytic and tailored remote sensing industries--rather than overtly or subtly competing with them;

5. The flexibility and know-how to mount active marketing, joint venture, sales and other campaigns--rather than the "passive" order taking approach to customers; and

6. Major incentives to explore the enormous changes in communications and information handling/processing for their commercial values for remote sensing.

Chapter VII. Private Sector Transfer Options and Oversight Structure

A. This chapter should show why wholly private ownership and operation of the civil weather and land satellites (Option 1) is the best option available to the government.

B. The "configuration" of each option needs to be thought-through and stated with more precision.

C. The discussion of the several P.L. 97-324 statutory criteria with respect to each option should conform to the stated advantages and disadvantages of that option, and should be internally consistent.

D. The advantages and disadvantages of each option should be tightened, strengthened and restated:

1. Option 1 - Wholly Private Ownership and Operation by an Entity(ies) Competitively Selected

Advantages

- The private sector can do it better than the government
- The government would save money, especially in the long run
- Meets foreign competition
- Demonstrates U.S. commitment to maintaining leadership in space
- Flexible selection process permits prompt implementation while providing for appropriate competition
- Data continuity would be maintained without increased cost to the government
- Government could concentrate efforts on advanced R&D
- Stimulates private investment in technology and hastens the introduction of new technology
- Fosters maximum development of commercial markets, provides a strong profit incentive for aggressive and vigorous market development and system efficiency, and is more responsive to user demands than the federal government
- Advances U.S. leadership in commercial application of technology
- Reduces future time and attention requirements of top officials on remote sensing matters
- Places commercialization risks in private sector
- Allows the government to share in the successful development of the commercial markets

- Can be structured to satisfy international obligations and ensure national security requirements

Disadvantages

- Requires time and attention of top government officials in short term
- Anticipated benefits of commercialization may not materialize
- Requires close supervision for foreign policy and national security reasons
- Will cost more than if government abandoned all financial assistance to land remote sensing (but not as much as government ownership and operation of additional activities after Landsat D Prime)
- Possible foreign concern re U.S. data providing/sharing obligations
- Users may have to pay higher fees than government would charge
- A contract between the government and a private entity will be complicated and difficult to draft

2. Option 2 - Phased-In Government/Private Ownership and Operation

Advantages

- Maintains government operation and control for a period of years
- National security and foreign policy concerns could be addressed gradually
- Permits phased capitalization for private entity

Disadvantages

- Delays transfer and may doom eventual complete commercialization
- In effect, precludes commercialization of the weather sattelites

- Does not achieve any cost savings to the government or result in system efficiencies
- Budget impacts much greater in short run if U.S. competitiveness is to be maintained
- Fails to make system responsive to user requirements
- Fails to encourage private R&D and technology development to meet foreign competition
- Discourages market development by maintaining uncertainty with respect to data continuity from government space segment
- Adversely effects market expansion because of lack of commercial control of system design, mission management and data delivery
- Fails to meet challenge of foreign competition
- Leaves control of transfer in agency with greatest incentive to maintain status quo

3. Option 3 - A Legislatively-Chartered, Privately-Owned Corporation

Note: The nature of this corporation, and in particular the extent of government control, was not specified in P.L. 97-324 and obviously must be further defined. The advantages and disadvantages set forth below assume the establishment of a new corporation by legislation, with government representation on, but not control of, the board of directors of the corporation.

Advantages

- Presidential appointment of at least a portion of the Board of Directors
- Supervision and control procedures/provisions for national security and international relations requirements would have a statutory basis

- Demonstrates high level of commitment to space and assumption by U.S. government of ultimate financial responsibility, while lessening Federal role somewhat from present levels
- Competition for equipment supplies can be mandated
- Ownership of company can be required to be distributed among the public and equipment and service suppliers
- More responsive to market forces and opportunities than complete government ownership and operation

Disadvantages

- Requires greater federal financial commitment than Option 1
- Passage of legislation and creation of new company may result in unacceptable delay
- Statutory monopoly could, without proper constraints, create a protected environment reducing commercial aggressiveness
- Fails to take advantge of the fact that there are private entities prepared to take over the systems now
- Data continuity would be lost without a continuing government program, which is in itself undesirable since the corporation should not be burdened with government-designed satellites and systems if at all possible
- Unless carefully crafted, could create an unwieldly mechanism of supervision and control

4. Option 4 - Continued Ownership and Operation by the Federal Government

Advantages

- Satellite systems would remain under federal control

- All international arrangements and existing national security controls would remain unchanged
- Maintains lowest cost to users for available data

Disadvantages

- Without substantial budget increases, U.S. civil land sensing would cease after Landsat D Prime and the civil weather sensing activities could be reduced
- Markets would remain undeveloped
- Foreign competition would go unchallenged; U.S. government and private users would eventually have to obtain remotely sensed data and services from foreign suppliers
- U.S. equipment manufacturers and service suppliers will have reduced markets
- Fails to reduce size or scope of government
- Government does not have incentives or flexibility to achieve efficiencies and savings that the private sector has
- Forfeits U.S. leadership in space and adversely affects U.S. ability to influence international events

MANAGEMENT OVERSIGHT MEETING

March 9, 1983

AGENDA

- MANAGEMENT OVERSIGHT RESPONSIBILITIES
- ROLE OF SELECTING OFFICIAL
- SCHEDULE OF EVENTS
- REPORTING STRUCTURE
- PRINCIPAL INTERFACES BY LEVEL
- ELEMENTS OF FEDERAL DATA REQUIREMENTS
- ELEMENTS OF TERMS AND CONDITIONS
- AREAS OF RESOLUTION BY INTERAGENCY BOARD
- SUMMARY BACKGROUND

Attachment R

SUMMARY BACKGROUND

DOC is embarking on a major, controversial effort with unique elements associated with:

- Size of Effort (Transfer of Responsibility for Weather, Land, and Ocean Satellites; Possible $5 Billion Data Purchase; Possible 15-Year Federally Guaranteed Funding to Private Industry)
- Possible Formation of a New Domestic Monopoly
- Lack of Current Cohesive Support from Academic, Government, Industrial, and Congressional Groups
- Process Unlike Any Before Attempted in the Government
- Required Pace of More Complex Administrative and Procurement Actions is Faster than for a Number of Recent Simpler Actions

ACTION DATE

ACTION	SECRETARY	MANAGEMENT OVERSIGHT	INTERAGENCY BOARD	SOURCE EVALUATION BOARD	BUSINESS ADVISORY COMMITTEE	TECHNICAL ADVISORY COMMITTEE	LEGISLATION DRAFTING COMMITTEE	INDUSTRY
Initiate Transfer	3/09/83							
Approve Transfer Structure		3/09/83						
Form Interagency Board and Request Identification of Members by Agencies		3/10/83-DA						
Appoint Source Evaluation Board (SEB) Chair and Members	3/15/83	3/14/83-DS*						
Appointments to Interagency Board Received			3/24/83					
First Meeting of Interagency Board - Charter - Working Groups			3/31/83					
Apoint Members of SEB and Working Groups - Bus. Advsy Cmte (BAC) - Tech. Advsy Cmte (TAC) - Leg. Drafting Cmte (LDC)			4/08/83*					

*Briefing of Key Congressional People

ACTION DATE

ACTION	SECRETARY	MANAGEMENT OVERSIGHT	INTERAGENCY BOARD	SOURCE EVALUATION BOARD	BUSINESS ADVISORY COMMITTEE	TECHNICAL ADVISORY COMMITTEE	LEGISLATION DRAFTING COMMITTEE	INDUSTRY
First Meeting SEB, BAC, TAC, LDC - Procedure Briefing - Task Assignments - Schedule				4/15/83				
Complete First Draft Industry Solicitation - Terms & Conditions - Federal Data Rqmts - Legislation					5/01/83	5/01/83	5/01/83	
Determine Qualification Criteria and Source List		5/09/83	5/03/83	5/01/83				
Complete Prerelease Package for Industry				5/02/83*				
Approve Prerelease Package for Issuance to Industry	5/10/83	5/09/83	5/03/83					
Comments from Industry Received								6/01/83

*Briefing of Key Congressional People

ACTION	ACTION DATE							
	SECRETARY	MANAGEMENT OVERSIGHT	INTERAGENCY BOARD	SOURCE EVALUATION BOARD	BUSINESS ADVISORY COMMITTEE	TECHNICAL ADVISORY COMMITTEE	LEGISLATION DRAFTING COMMITTEE	INDUSTRY
Redrafts Complete					6/08/83	6/08/83	6/08/83	
Industry Solicitation Ready for Interagency Coordination				6/15/83				
Complete Interagency Coordination				6/22/83				
Approve Solicitation for Release	6/24/83	6/24/83*	6/23/83					
Release Solicitation to Industry				6/27/83				
Industry Briefing				7/14/83*				
Systems Audit by Industry								7/83**
Draft Selection Criteria Prepared					7/27/83	7/27/83	7/27/83	
Approval of Selection Criteria	8/29/83	8/26/83*	8/12/83	7/29/83				
Proposals Due								9/27/83

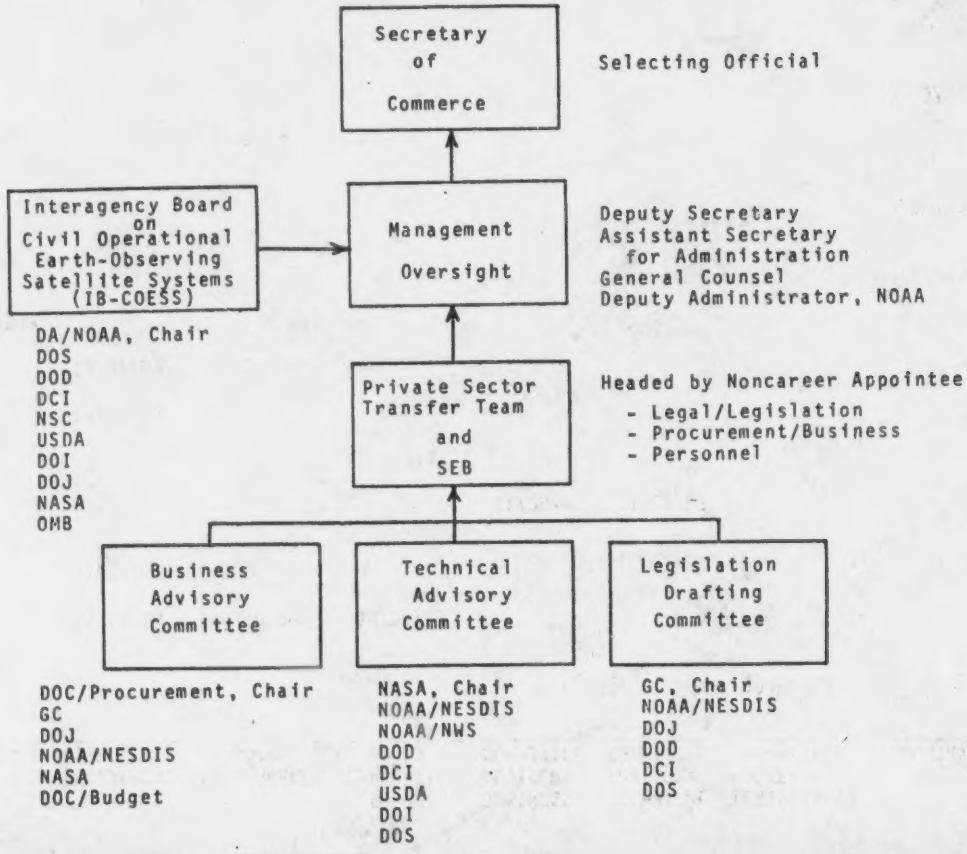
*Briefing of Key Congressional People
**To Be Scheduled to Accommodate Industry and Operations Needs

ACTION DATE

ACTION	SECRETARY	MANAGEMENT OVERSIGHT	INTERAGENCY BOARD	SOURCE EVALUATION BOARD	BUSINESS ADVISORY COMMITTEE	TECHNICAL ADVISORY COMMITTEE	LEGISLATION DRAFTING COMMITTEE	INDUSTRY
Draft Legislation Complete							10/04/83	
Interagency Coordination of Legislation Complete		10/14/83	10/10/83	10/05/83				
Legislation to Congress		11/04/83*						
BAC, TAC Evaluation Complete					11/25/83	11/25/83		
SEB Review Complete				11/30/83				
Legislation Passed		12/05/83						
Approve SEB Recommendation		12/07/83	12/06/83					
Selection Made	12/08/83*							
Complete Negotiations								1/09/84
Initiate Transition Training								1/09/84
Issue Termination Notice to Employees			2/09/84					
Complete Transition								3/09/84

*Briefing of Key Congressional People

REPORTIN STRUCTURE



MANAGEMENT OVERSIGHT RESPONSIBILITIES

- o APPROVE TRANSFER STRUCTURE - 3/09/83
- o RECOMMEND SEB CHAIRPERSON AND MEMBERS TO SECRETARY - 3/14/83
- o APPROVE SOURCE QUALIFICATION CRITERIA AND SOURCE LIST - 5/09/83
- o RECOMMEND APPROVAL OF PRERELEASE PACKAGE FOR INDUSTRY TO SECRETARY - 5/09/83
- o RECOMMEND APPROVAL OF SOLICITATION TO INDUSTRY BY SECRETARY - 6/24/83
- o RECOMMEND SELECTION CRITERIA TO SECRETARY - 8/26/83
- o APPROVAL OF SEB RECOMMENDATION TO SECRETARY - 12/07/83

ROLE OF SELECTING OFFICIAL

- o ESTABLISHMENT OF SOURCE EVALUATION BOARD
- o ESTABLISHMENT OF CRITERIA FOR SELECTION
- o APPROVES DATA REQUIREMENTS, TERMS, CONDITIONS, AND LEGISLATION ELEMENTS TO BE INCLUDED IN SOLICITATION
- o MAKES SELECTION

PRINCIPAL INTERFACES BY LEVEL

SECRETARY	-	OMB/Stockman
		NSC
		State
DEPUTY SECRETARY	-	OMB/Wright
		SIG(Space)
		State
		DOD/DCI
NOAA	-	OMB
		IG(Space)
		State
		DOD/DCI
		USDA
		DOI
		NWS
		AFGWC
		FNOC
		WMO

ELEMENTS OF FEDERAL DATA REQUIREMENTS

- o WEATHER DATA
  - ATMOSPHERIC SOUNDINGS
    - ACCURACY
    - FREQUENCY
    - REPLACEMENT FOR U.K. SOUNDING UNIT
    - RAW OR PROCESSED DATA
  - IMAGING
    - DIRECT BROADCAST
    - SPECTRAL BANDS

- o OCEAN DATA
  - GULF STREAM ANALYSES
  - SEA SURFACE TEMPERATURE
  - GROWTH CAPABILITY

- o LAND DATA
  - SPATIAL RESOLUTION
  - SPECTRAL BANDS
  - STEREO

ELEMENTS OF TERMS AND CONDITIONS

- LENGTH OF GUARANTEE
- PHASE-OUT PROCESS FOR GUARANTEE
- SERVICE RELIABILITY REQUIREMENTS
  - REDUNDANCY
  - CALL-UP LAUNCHES
- PROVISIONS FOR CONTRACT MODIFICATION
  - CHANGES IN SERVICE REQUIREMENTS
  - CHANGES IN COSTS
  - TERMINATION OF SERVICES
- PROVISIONS FOR DESIGN REVIEWS BY DOD/DCI
- PREEMPTION CRITERIA
- INTERNATIONAL RELATIONS CONSIDERATIONS

ISSUES TO BE ADDRESSED BY INTERAGENCY BOARD

- NATIONAL SECURITY
- INTELLIGENCE
- FOREIGN POLICY
- ANTITRUST

Attachment S

ILLUSTRATIVE EDITING OF REPORT TO CONGRESS

Complete copies of report submitted for approval and final edited report are in the DOC documents room. The following paragraphs provide a few illustrative examples of what editing was done.

The first example is a short paragraph on the original document's page I-4. As can be seen on the next page, the paragraph stated that--

> The extensive Federal interests and international relations considerations lead to the need for a regulatory framework within which a private sector owner/operator provides services. The factors that must be addressed in establishing the regulatory framework are discussed in Chapter V.

The marginal note by Bayer, Mr. Fiske's assistant, says, "gibberish" with a double underline, and neither this paragraph nor Chapter V appear in the final version. It domonstrates the strong antipathy against even the acknowledgement that legitimate Federal interests may be involved. A further comment on the paragraph says, "No mention of the private sector's interests."

and (d) weather forecasting, by providing basic data about sea surface and atmospheric conditions necessary to improve national and international forecasts.

One of the most important characteristics shared between weather and ocean satellites is the need for a continuing global observation of a rapidly changing medium whose changes have important human and economic effects. This leads both weather and ocean systems to require frequent or continuous coverage of essentially the entire Earth, and necessitates a capability for rapid world-wide data dissemination. These commonalities suggest a future system that would merge weather and ocean sensing capabilities.

It is within the above technological and market context that the transfer of civil operational Earth observations to the private sector must be considered. The next two chapters of this report will discuss the policy base for determining the proper division of Federal and private sector roles and the steps that have led to an Administration policy on transfer of the satellite systems. These chapters are followed by the technical review, mentioned above; of the weather and land satellite systems.

The extensive Federal interests and international relations considerations lead to the need for a regulatory framework within which a private sector owner/operator provides services. The factors that must be addressed in establishing the regulatory framework are discussed in Chapter V.

The analysis of data markets in Chapter VI completes the background material that supports the discussion of commercialization that is the subject of the remainder of the report.

A second example concerns the original page II-7. As can be seen on the next page, the final sentence said, "The exact approach that best satisfies the national interests will be defined through the joint efforts of the Administration and the Congress."

Mr. Bayer's note says, "No! We will propose a method that will best satisfy---"

Some situations are covered by straightforward application of A-76 procedures. For example, if a Federal agency required maintenance services and either has a civil service staff in place or would have to establish one, the comparison between that mode and employing a private contractor is easily accomplished--at least in principle. In another instance, a comparison can be made between a Federal agency's continuing to use in-house printing facilities and contracting for those services from a private firm. The civil remote sensing systems are far more complex than these examples, and their transfer does not appear to fit well into the A-76 process. The transfer is without direct precedent and a mechanical adherence to procedures outlines in the circular is not likely to be the most appropriate approach. The exact approach that best satisfies the national interests will be defined through the joint efforts of the Administration and the Congress.

Then why apply A-76 process at all?

No! We will [illegible] the best solution

The tone of the editing is seen further in the first two pages of the original Chapter III. This chapter provided a broad review of the process leading to the decision and the participants in the process. The next two pages show Mr. Bayer's editing. On page III-1, for example, the report originally said, "The Carter Administration initiated the examination of the issue, but elected to limit commercialization to the land satellites; the current Administration reiterated the Carter position on land satellites and added the environmental satellites to the examination." Mr. Bayer's marginal note says, "Should not be raised."

On page III-2, Mr. Bayer directs that the Administration's decision to delete the third and fourth satellites in the Landsat-D series not be mentioned, or as his marginal note says, "Out." Even more significant, the quotation at the bottom of page III-2 taken from an OMB memorandum (included as Attachment A in this notebook) has Mr. Bayer's marginal note, "Points at COMSAT."

III. STEPS IN THE DEVELOPMENT OF THE PRIVATE SECTOR TRANSFER POLICY

The civil space Earth-observing systems include the land, polar-orbiting environmental (weather), and geostationary environmental satellites. There are five operational satellites in orbit and eight satellites in various stages of manufacture, test, or storage. The systems also include data processing and distribution facilities at Greenbelt, Suitland, and Camp Springs, Maryland; and Sioux Falls, Scuth Dakota; as well as tracking facilities at Gilmore Creek, Alaska, and Wallops Island, Virginia. The acquisition costs for this equipment were nominally $1.6 billion, not including initial research and development or the costs of preceding satellites in either the land or environmental series.

A central issue that now has spanned two Presidents' Administrations is whether all or any part of this complex of systems should be transferred from the Government to private ownership. The Carter Administration initiated the examination of the issue, but elected to limit commercialization to the land satellites; the current Administration reiterated the Carter position on land satellites and added the environmental satellites to the examination.

President Carter's decision on operational civil space Earth observations was the result of a two-year review of the nation's space policy. This effort included the formation of the Policy Review Committee (PRC) on Space as the senior interagency body to coordinate space matters, to replace the Under Secretaries Committee (chaired by State) that was used as the policy coordinating body under the Nixon and Ford Administrations. In May 1978, President Carter announced that the United States would encourage domestic commercial exploitation of space capabilities under appropriate U.S. authorization and supervision. In October 1978, the President made a commitment to ensuring continuity of land sensing data, and reiterated that commitment in his March 1979 Science and Technology message.

From October 1978 through the summer of 1979, the Executive Branch examined a range of issues, including the potential for integrating civil and military Earth observation systems and greater private sector involvement in those systems. This examination led to a Presidental directive issued in November 1979 that provided the framework for civil operational remote sensing. The chief policies stated by the directive were:

- Assignment of the Federal management role for civil space remote sensing to the National Oceanic and Atmospheric Administration (NOAA).
- Continuation of separate military and civil polar-orbiting environmental satellites.

- o Establishing a goal of eventual transfer to the private sector of the land remote sensing system.

- o Commitment to continuity of land remote sensing data through the 1980s.

This process is described in greater detail in the NOAA document describing the conclusions of the Satellite Task Force.*

Shortly after President Reagan entered office, it was announced that the Administration would terminate the commitment to land sensing satellite data continuity through the 1980s on the basis that:

> It is the Administration's judgment that the present NASA investment in Landsat is sufficient to permit evaluation of operational uses of Landsat data and, if these uses are cost effective, to attract a private sector owner/operator.
>
> NASA's program to develop, launch, and test the two additional satellites already in manufacture (Landsat D and D') will continue as previously planned. Expansion and extension of the U.S. civil land remote sensing program, beyond that already funded by NASA, is inconsistent with the need for across-the-board fiscal restraints....

The two additional satellites, frequently referred to as Landsat D" and D"', then were deleted from the budget. Further reference material, including copies of pertinent policy documents, are available in a separate report.**

In response to an inquiry from a private firm, the Administration then elected to widen the discussion of commercialization to include the civil weather satellites. The addition of the civil weather satellites increased the complexity of the process. The then Deputy Director of the Office of Management and Budget asked the Cabinet Council on Commerce and Trade (CCCT), a senior Cabinet-level policy-making body chaired by the Secretary of Commerce, to address two issues.

1. What is the best mechanism to implement the current policy of transfer of civil land remote sensing systems (Landsat) to the private sector as soon as possible?

---

* Satellite Task Force, "Planning for a Civil Operational Land Remote Sensing Satellite System: A Discussion of Issues and Options," NOAA, Department of Commerce, June 20, 1980.

** "Commercialization of the Civil Space Remote Sensing Systems --A Review," NOAA/NESS, September 1982.

Continuing in Chapter III of the original report, the next page shows that Mr. Bayer deleted the reference to the availability of the Halbouty report. This is consistent with his comment on the final page of Chapter III which says, "None of this process section is relevant. It will only serve to delay the process as the Congress probes into the decisions and flow of recommendations." The entire chapter was then deleted from the report.

Further comments will not be made here, but the original statement of the options and their advantages and disadvantages should be compared with the final statement. They appeared in Chapter VII of the original report and in Chapter II of the final version. They are available in the DOC documents room.

in the responses or in the final outcome. The five members included two from end-user industries, one from academia, and two from financial/investment institutions. The subcommittee is shown with the title "Commercialization WG" in Figure III-1.

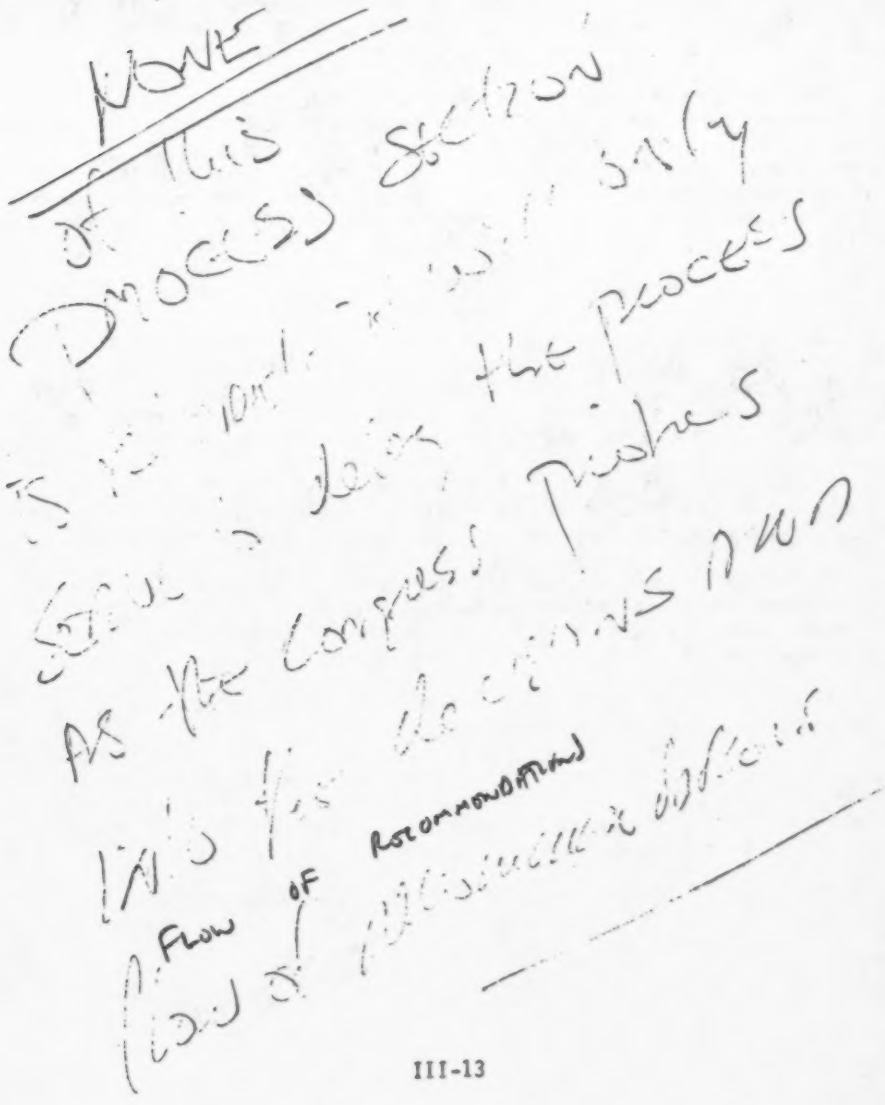
The subcommittee met November 1-4, 1982, and submitted a written report to the full committee at a meeting on November 18-19, 1982. The advisory committee incorporated the subcommittee's report in its recommendations to the Secretary of Commerce, which were made on November 19. The recommendations were:

> The Committee believes, without reservation, that the U.S. Government must commit itself in the best interest of the nation to the continuity of a governmental and/or private sector civil land remote sensing system. This conviction stems not only from the role remote sensing technology will play in enhancing the economic base of the country but also from the pervasive influence such information will have on improving the future quality of life on Earth.
>
> Therefore, we recommend that:
>
> 1) The Government of the United States will attempt to negotiate an arrangement with private industry to own and/or operate under contract specified space and ground segments, up to and including only archiving of raw unprocessed data, or the land satellite system by itself, or both the meteorological and land satellite systems.
>
> 2) The Government of the United States will make a firm, long range commitment to continue to provide or cause to be provided viable R&D programs on both the land and meteorological satellite projects.
>
> 3) The requirement be made that the operator, whether it be the Government and/or the private sector, subscribe to the open sky policy --which primarily means that anyone, anywhere, in any country can purchase the data at equitable prices.
>
> 4) All necessary legislation and appropriations be enacted at once to implement these recommendations.
>
> The Land Remote Sensing Satellite Advisory Committee unanimously endorses this report and its recommendations and its recommendations and offers its continued assistance to Secretary Baldrige in the implementation of this report.

The full report of the Halbouty Committee is available on request.

The CCCT met on December 15, 1982 and reached a consensus agreement. A recommendation was forwarded to the President on January 5, 1983.

The next chapter provides an overview of the characteristics of the weather and land satellites and services they provide.



THE WHITE HOUSE

WASHINGTON

Attachment T

February 28, 1983

MEMORANDUM FOR THE PRESIDENT

FROM: THE CABINET COUNCIL ON COMMERCE AND TRADE

SUBJECT: Transfer of the Civil Space Remote Sensing Systems to the Private Sector

Issue

Should the Administration transfer to the private sector the civil operational land and weather satellite systems?

Background

The current U.S. program in operational civil space remote sensing consists of a single land satellite and four operational weather satellites in orbit. Civil ocean observing satellites have demonstrated their utility also, although there are no operational systems currently in place. A number of private entities have expressed interest in assuming responsibility for portions of the civil space remote sensing system. Some firms are interested in the land satellite systems; another is interested in both the land and weather satellite systems.

Foreign governments have recognized the value of this technology. Civil space remote sensing systems are being advanced by France, Japan, the European Space Agency, India, Canada, the Federal Republic of Germany, and the Soviet Union. To date, only France has actually invested in a land remote sensing system (SPOT); others have invested only in weather systems.

All agencies believe that self-supporting, successful private ventures could evolve in the land and weather sensing markets. However, the time required for this process, as well as the potential size and characteristics of the market, once evolved, are uncertain. The Government provides a steady market for weather data. The value of land satellite data to the U.S. Government has not been rigorously established. Federal user agencies have been happy to use data now provided at subsidized costs, but, if required to pay the full cost of land satellite data, they indicate an intention to consider other means to meet their needs. Therefore, to avoid discriminating against economically desirable alternatives, the Federal Government should allow agencies to choose the most cost-effective means of obtaining data.

Other than Federal users, the land satellite data market has not grown as rapidly as it could have because of the inherent limitations on the Government in developing domestic and international markets. The market for land remote sensing data will have to be further developed. If given the opportunity, an aggressive private sector operation could expand the market base for this product.

The U.S. Government is currently spending more than $14 billion per year on the civil and national defense space programs, of which nominally $150-$200 million is devoted to civil space remote sensing. The Administration's current budget includes funding for the long term operation and replacement of the civil weather satellite. For land remote sensing, the current policy is to continue with the two land satellites which were purchased prior to this Administration and are expected to last until 1988. Thus, the budget has only operating costs and does not include additional Federal funding to procure additional land satellites. The budget assumes that any future land remote sensing systems would have to be developed, launched, and operated by a private entity. Current budget projections do not include funding for development and implementation of expanded uses of data generated by land satellite programs.

The United States has created this high-technology field, but it could lose its leadership position in land remote sensing unless action is taken to preserve it. It should be noted, though, that NASA and DOD are heavily committed to R&D in this field. Also, some private U.S. firms have expressed strong interest in entering the field. Any action taken to transfer civil space remote sensing to the private sector should in no way preclude the continuation of R&D in NASA and DOD to advance remote sensing technology.

Transfer to a private entity without any government assurances would be preferable and will be actively sought. However, implementing a commercial satellite system may involve some form of Government-assured market for a time, e.g., a guaranteed minimum purchase agreement, until the private entity is firmly established. The level of need for such support, if any, will be considered carefully in the evaluation of proposals actually submitted. Such support could raise future budget outlays by as much as $150 million per year, in 1983 dollars, above current budget projections.

Federal interests will require a continuing oversight to any private entity involved in civil space remote sensing, as outlined by existing international law, national law and current

national space policy. Such oversight, carried out with interagency coordination and contractual provisions between the Government and the data supplier, will assure that national defense, intelligence, and foreign relations concerns are satisfied.

The Cabinet Council on Commerce and Trade has extensively reviewed the issue and has identified two principal options for your consideration:

Option 1: Transfer to the private sector, by competitive means, the current operational civil remote sensing satellites. Separate bids would be accepted for the land or weather satellites, or a firm could elect to submit a single bid for all systems.

The Department of Commerce will oversee the transfer of the civil operational remote sensing satellites to the U.S. private sector as soon as possible. The selection of the private entity would occur under conditions of competition among U.S. firms only. The transfer will be guided by the following principles:

(1) National security and foreign policy concerns must be appropriately addressed in preparing legislation, requesting proposals, and overseeing the private entity or entities.

(2) The selection of the private entity would occur under competitive conditions. Private firms would have the option of bidding separately for the land or weather satellite system or preparing a joint submission for both. The financial and program justifications would be presented in such a manner that separate submissions can be appropriately compared to joint submissions.

(3) The Department of Commerce would establish an inter-agency coordinating body as soon as possible.

Advantages

- Stimulates technology development by the private sector in response to new market demands and expands the role of private industry.

- o Demonstrates commitment to the private sector role in space.
- o Reduces the size and scope of Government activities.
- o Increases the probability that information flows from land satellites will continue.

Disadvantages

- o May require increasing Federal funding to cover minimum purchase commitments by the Government, until the private entity is firmly established.
- o There is a possibility that a new regulatory structure would be required.

Option 2: Continue the current budget policy of bringing the operational land remote sensing systems in the Government to a close nominally by 1988 (or sooner if private industry is willing to take it over) and retain the civil weather satellites under Government control.

Advantage

- o Option is within current budget.

Disadvantages

- o Only minimally reduces the size and scope of Government.
- o May result in the relinquishment of land remote sensing to foreign competitors by U.S..

Decision

Option 1 ✓ Transfer to the private sector, via competitive means the current operational civil weather and land satellites. Separate bids would be permitted for the land or weather satellites, or a firm could elect to submit a single bid for all.

Option 1 unanimously supported by the Cabinet Council on Commerce and Trade

Option 2 ___ Continue the current budget policy of bringing the operational land remote sensing systems in the Government to a close nominally by 1988 or sooner if private industry is willing to take it over, and retain the civil weather satellites under Government control.

Malcolm Baldrige
Chairman Pro Tempore
Cabinet Council on Commerce and Trade

Attachment U

STATEMENT OF

SECRETARY OF COMMERCE MALCOLM BALDRIGE

BEFORE THE

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE

RESEARCH AND ENVIRONMENT

AND THE

SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS

OF THE

COMMITTEE ON SCIENCE AND TECHNOLOGY

UNITED STATES HOUSE OF REPRESENTATIVES

APRIL 14, 1983

CHAIRMAN SCHEUER, CHAIRMAN VOLKMER, MEMBERS OF THE SUBCOMMITTEES, I AM PLEASED TO BE HERE TO DISCUSS THE ADMINISTRATION'S PROPOSAL FOR TRANSFERRING NOAA'S LAND AND WEATHER SATELLITES TO THE PRIVATE SECTOR. I APPRECIATE THE OPPORTUNITY THIS HEARING GIVES US TO SET OUT FOR PUBLIC REVIEW THE ADMINISTRATION PROPOSAL AND THE ARGUMENTS FOR THE PROPOSAL.

THE BEST WAY TO BEGIN IS TO EXPLAIN WHAT THE PRESIDENT DECIDED, AND THEN DISCUSS WHY.

FIRST, THE PRESIDENT RECOGNIZED THAT THERE WOULD BE GREAT BENEFITS TO THE COUNTRY IF THE PRIVATE SECTOR WERE ABLE TO OPERATE LANDSAT AND MARKET THE DATA IT GENERATES BY THE SYSTEM. THIS IDEA IS NOT NEW. THE PREVIOUS ADMINISTRATION RECOGNIZED THE BENEFITS OF PRIVATE OPERATION OF LANDSAT.

SECOND, THE PRESIDENT DECIDED THAT WE SHOULD BEGIN THE WORK NECESSARY TO FIND OUT WHETHER THE PRIVATE SECTOR IS WILLING AND ABLE TO OPERATE EITHER LANDSAT ALONE - OR LANDSAT AND THE WEATHER SATELLITES TOGETHER - OR THE WEATHER SATELLITES ALONE.

FINALLY, THE PRESIDENT LAID DOWN SOME CLEAR GROUND RULES FOR DECIDING WHETHER IT IS CONSISTENT WITH THE NATIONAL INTEREST TO TRANSFER LANDSAT ALONE OR LANDSAT AND THE WEATHER SATELLITES TO A PRIVATE OPERATOR:

- NO TRANSFER CAN TAKE PLACE UNLESS OUR DEFENSE AND FOREIGN POLICY INTERESTS ARE PROTECTED.

- NO TRANSFER CAN TAKE PLACE UNLESS THE DATA THAT THE WEATHER SERVICE NEEDS TO OFFER THE PUBLIC THE SERVICES IT NOW PROVIDES IS GUARANTEED.

- ALSO, IT HAS TO BE A GOOD DEAL FOR THE TAXPAYERS.

THERE IS A PRESSING NEED TO DEVELOP A STRONG COMMERCIAL MARKET FOR LANDSAT DATA. THE MARKET WILL NOT GROW AS RAPIDLY AS IT SHOULD WHILE LANDSAT IS BEING OPERATED BY A GOVERNMENT AGENCY. GOVERNMENT AGENCIES SIMPLY LACK THE INCENTIVE AND ABILITY TO DEVELOP DOMESTIC AND INTERNATIONAL COMMERCIAL MARKETS. THE PRIVATE SECTOR HAS A PROFIT INCENTIVE AND EXPERIENCE IN MARKETING NEW PRODUCTS. FOR THESE REASONS, THE PRIVATE SECTOR IS FAR MORE ABLE THAN GOVERNMENT TO PERFORM THE CHALLENGING JOB OF EXPANDING THE MARKET BASE FOR LANDSAT DATA.

THE POTENTIAL FOR COMMERCIAL MARKET DEVELOPMENT IS THERE. OVER THE YEARS, MINERAL AND ENERGY COMPANIES, FIBER AND FOOD CROP INTERESTS, TIMBER PRODUCERS, LAND USE PLANNERS AND HYDROLOGY CONSULTANTS ALL DISCOVERED THERE WAS VALUE IN LANDSAT DATA.

BUT NOAA ISN'T A MARKETING AGENCY. THE TAXPAYERS DON'T EXPECT IT TO TAKE ON COMMERCIAL RISKS NECESSARY FOR DEVELOPING MARKETS FOR GOODS AND SERVICES. THESE ARE TASKS THAT ONLY PRIVATE FIRMS HANDLE WELL. IF THE GOVERNMENT CONTINUES IN CHARGE OF LANDSAT, POTENTIAL ECONOMIC BENEFITS WILL SLIP AWAY FROM US.

AT THE SAME TIME, WE RECOGNIZE .HAT OPERATING LANDSAT IN A WAY THAT SATISFIES THE GOVERNMENT'S NEEDS FOR DATA NOW GENERATED BY THE SYSTEM POSES GREAT FINANCIAL RISKS TO A PRIVATE OPERATOR. FOR NATIONAL SECURITY AND FOREIGN POLICY REASONS, THE GOVERNMENT MUST IMPOSE CERTAIN RESTRICTIONS ON ANY PRIVATE OPERATOR. IT IS POSSIBLE THAT NO FIRM WOULD BE WILLING TO TAKE ON OPERATING LANDSAT WITH THESE RESTRICTIONS AND THE NEED TO SPEND THE MONEY NECESSARY TO DEVELOP MARKETS.

ANY PRIVATE FIRM THAT UNDERTAKES TO ACQUIRE THE LANDSAT SYSTEM, BUY FOLLOW-ON SATELLITES AND ESTABLISH A PRIVATE MARKET FACES A VERY REAL RISK. THAT'S THE MAIN REASON FOR ALLOWING THE PRIVATE SECTOR TO BID ON THE WEATHER SATELLITES.

THEY CAN PROVIDE THE REVENUE BASE A PRIVATE OPERATOR NEEDS TO TAKE ON THE COST OF DEVELOPING PRIVATE COMMERCIAL MARKETS FOR DATA GENERATED BY THE SYSTEMS. DOING THIS EXPANDS THE RANGE OF OPTIONS OPEN TO US IN GOVERNMENT. ONCE BIDS ARE IN, WE MAY FIND THAT THE COMBINATION OF REVENUES FROM WEATHER OPERATIONS AND ECONOMIES MADE POSSIBLE BY INTEGRATING THE SYSTEMS CAN LEAD TO BETTER LAND AND WEATHER DATA FOR EVERYBODY AT LESS COST.

THE WEATHER SERVICE WILL NOT SUFFER. THE DATA IT NEEDS WILL BE AVAILABLE.

I WANT TO MAKE THIS ABSOLUTELY CLEAR: WE ARE NOT DISMANTLING, DISBANDING, SELLING OR IN ANY WAY HARMING THE NATIONAL WEATHER SERVICE. THERE'S BEEN MORE CONFUSION ON THIS ISSUE THAN ON ANY OTHER PART OF OUR PROPOSAL.

THE WEATHER SERVICE WILL BE AROUND FOR A LONG, LONG TIME. THE ONLY DIFFERENCE WE MAY SEE IS THAT THE SATELLITE DATA IT USES WILL COME FROM A PRIVATE OPERATOR INSTEAD OF THE GOVERNMENT'S ENVIRONMENTAL SATELLITE, DATA AND INFORMATION SERVICE, WHERE THE WEATHER SERVICE NOW GETS THE DATA.

I'M JUST AS CONFIDENT THAT WE CAN IDENTIFY AND RESOLVE THE NATIONAL SECURITY AND FOREIGN POLICY ASPECTS OF A TRANSFER.

WE WILL BE CERTAIN THAT AN OPERATOR PROVIDES PRIORITY SERVICE TO THE DEFENSE DEPARTMENT; THAT THERE WILL BE ADEQUATE

CONTROLS FOR DENYING SATELLITE USE TO HOSTILE FORCES; AND THAT COMMAND AND CONTROL CAN BE TRANSFERRED TO DOD IN EMERGENCIES.

IN ADDITION, WE HAVE NO INTENTION OF CHANGING OUR POLICY OF PARTICIPATING IN THE FREE, INTERNATIONAL EXCHANGE OF WEATHER DATA. WE FULLY UNDERSTAND THAT NO COUNTRY'S FORECASTING SERVICE CAN OPERATE ONLY WITH DATA TAKEN WITHIN IT'S OWN NATIONAL BOUNDARIES.

ANOTHER MAJOR ISSUE THAT WE WILL LOOK AT IS THE EXTENT TO WHICH A PRIVATE OPERATOR CAN CONTROL THE SATELLITE DATA. WE'LL WANT TO GIVE HIM AS MUCH FREEDOM AS WE CAN BUT WE WILL HAVE TO CONSIDER THIS ISSUE FROM AT LEAST TWO STANDPOINTS.

FIRST, WE WILL MAKE SURE THAT INTERNATIONAL ACCEPTANCE OF THE "OPEN SKIES POLICY" IS NOT JEOPARDIZED - THAT IS, OUR FREEDOM TO COLLECT SATELLITE DATA OVER OTHER NATIONS FOR PEACEFUL PURPOSES. TO ENSURE ITS ACCEPTANCE, WE HAVE FOLLOWED A PRACTICE OF SHARING THE BENEFITS OF CIVIL REMOTE SENSING TECHNOLOGY ON A NONDISCRIMINATORY BASIS. THESE POLICIES AND PRACTICES HAVE SERVED US WELL. STRIKING THE PROPER BALANCE BETWEEN THEM AND AN OPERATOR'S NEEDS WILL BE A TOP PRIORITY.

SECOND, WE WILL BE ALERT TO THE POSSIBILITY THAT LANDSAT DATA MAY HAVE IMPORTANT MILITARY VALUE. THIS CAN BE PARTICULARLY

IMPORTANT AS SATELLITE TECHNOLOGY ADVANCES AND VALUE-ADDED SERVICES BECOME MORE SOPHISTICATED. IT CAN BE ESPECIALLY IMPORTANT IF OUR EFFORTS ARE SO SUCCESSFUL THAT OTHER PRIVATE FIRMS ENTER THE FIELD. WE'LL BE WORKING VERY CLOSELY WITH DOD ON THIS.

IN SHORT, THE TRANSFER WE PROPOSE IS NO EASY THING AND NO SURE THING. BUT NONE OF THE PROBLEMS INVOLVED ARE BEYOND HUMAN EFFORT AND INGENUITY. THEY CAN BE HANDLED BY LEGISLATION, CONTRACTS, REGULATION TO THE EXTENT NEEDED, AND GOOD WORKING RELATIONSHIPS BETWEEN AGENCIES AND THE PRIVATE OPERATOR. IT'S IMPORTANT THAT WE TRY. AND THAT BRINGS ME TO THE LAST PART OF THE ADMINISTRATION'S DECISION: WHY IS IT SO IMPORTANT THAT WE ACT NOW TO FIND OUT IF A TRANSFER IS POSSIBLE?

IF WE CONTINUE WITH GOVERNMENT OPERATION OF THE LAND AND WEATHER SATELLITES AND OTHER COUNTRIES ARE SUCCESSFUL IN THEIR EFFORTS TO DEVELOP AND FLY BETTER SATELLITES AND MEET USER NEEDS, POTENTIAL CUSTOMERS WILL TURN TO THEM. OUR BEST DEFENSE AGAINST IMPENDING COMPETITION IS TO GET THESE SATELLITES INTO THE HANDS OF A COMPETENT FIRM THAT CAN BUILD ON THE TECHNOLOGY AND KNOWS HOW TO PROVIDE WHAT CUSTOMERS NEED.

FRANCE INTENDS TO LAUNCH THE FIRST OF A SERIES OF FOUR LAND-

OBSERVING SATELLITES IN 1984. JAPAN, CANADA, GERMANY, THE EUROPEAN SPACE AGENCY, INDIA AND THE SOVIET UNION ARE ALL ACTIVELY DEVELOPING SATELLITE REMOTE SENSING PROGRAMS.

MUCH OF THE TECHNOLOGY ON WHICH THESE PROGRAMS DEPEND WAS DEVELOPED HERE. IT WOULD BE IRONIC IF THESE COUNTRIES, BUILDING ON SKILLS DEVELOPED IN THE UNITED STATES, ESTABLISHED THE KIND OF MARKET THAT NOAA CAN'T AND TURNED US INTO A NET IMPORTER OF SATELLITE DATA PRODUCTS AND SERVICES.

POSTPONING A DECISION WILL ONLY GIVE THESE COUNTRIES A HEAD START THAT WILL BE HARD TO OVERCOME LATER. THE LONGER WE WAIT, THE MORE LIKELY THIS BECOMES.

OUR PLAN WILL LET US FIND OUT ONCE AND FOR ALL IF LANDSAT HAS SUBSTANTIAL ECONOMIC VALUE AND WHETHER A TRANSFER TO THE PRIVATE SECTOR UNDER THE CONDITIONS IMPOSED BY THE PRESIDENT IS POSSIBLE.

WE HAVE A LOT TO DO. WE HAVE TO DEVELOP THE GROUND RULES UNDER WHICH COMPETITIVE BIDDING CAN TAKE PLACE. WE HAVE TO DESIGN A REQUEST FOR PROPOSALS AND A PROCEDURE FOR EVALUATING THE PROPOSAL SUBMITTED. WE HAVE TO ESTABLISH AN INTER-AGENCY COORDINATING BODY TO MAKE SURE ALL PROPER FEDERAL INTERESTS ARE TAKEN CARE OF. IF WE FIND THAT A TRANSFER IS FEASIBLE, WE WILL HAVE TO DEVELOP AND SUBMIT TO THE CONGRESS THE LEGISLATIVE AUTHORIZATION NECESSARY TO ACHIEVE A TRANSFER.

BUT WE WILL NOT WAIT UNTIL WE PROPOSE LEGISLATIVE AUTHORIZATION FOR A TRANSFER TO CONSULT WITH THE APPROPRIATE CONGRESSIONAL COMMITTEES. WE INTEND TO INVOLVE THESE COMMITTEES IN EVERY SIGNIFICANT STEP WE TAKE. IN FACT, WHAT I HAVE IN MIND IS MORE THAN "CONSULTING." WE'LL BE ACTIVELY SEEKING CONGRESS' ADVICE AND GUIDANCE AS WE GO ALONG. WE'RE PRETTY SURE CONGRESS WON'T BE TOO SHY ABOUT PROVIDING IT.

THANK YOU.

Control of the satellite would be maintained with the yaw and pitch thrusters during that period.

Program officials said here last week that they were reasonably satisfied with the status of TDRS-A in its present orbit, and were in no hurry to begin the transfer until they were confident they could accomplish the change with minimal risk.

"We're not putting any time pressures on ourselves," Wellens said. "We would like to do this in a reasonable time, but want to be super-sure what we do is correct. We're hurrying with restraint."

Managers Pleased

Wellens and other program officials were buoyed by the fact that the satellite went through the deployment of its antennas and solar arrays in an essentially routine manner, despite the unorthodox maneuvers and stresses the satellite had encountered.

"The satellite was supposed to be held very calmly by the IUS while everything unfolded," Rob Browning, NASA's TDRSS program manager, said. "Instead, it was thrown out into space, stabilized inertially, and then deployed itself. The deployment sequence went very much according to the nominal plan and timeline."

The second Tracking and Data Relay Satellite, TDRS-B, is now nearing completion at TRW and will be ready to be shipped to Cape Kennedy May 20 in preparation for a scheduled launch on the eighth space shuttle mission in August. Shipment could be held up, however, depending on the outcome of the current investigation of the IUS malfunction on this month's launch.

"I think the feeling among the NASA people I've talked to is we're not going to fly again until we thoroughly understand what happened to that IUS, and the problem has been rectified and tested," said Edwin A. Coy, vice president and TDRSS program manager for Spacecom.

"We're proceeding with our planning for shipment, based on an August launch date for STS-8," Browning said. "But we will not ship until we understand the IUS and until we have a schedule for integration at the Cape that gives us minimal time at Kennedy Space Center." □

Army Aviation

Washington—Army officials have approved the establishment of aviation as a separate branch of the Army. The decision will not change the overall mission of Army aviation nor will it affect the Air Force mission of providing close air support for Army ground troops.

Previously, aviation was a combat specialty but was not a separate branch such as infantry, artillery and armor.

Comsat Confirms Job Contacts With Satellite Transfer Official

Washington—Comsat officials have confirmed they contacted Deputy Commerce Secretary Guy W. Fiske about an executive position during the period in late 1981 and 1982 when the Commerce Dept. was involved in a decision to transfer weather satellites to the private sector.

Comsat is among those interested in acquiring private operation of Landsat and weather satellites (AW&ST Apr. 18, p. 30; Apr. 4, p. 48).

New hearings with Fiske this week are being considered by the House Science and Technology subcommittee on natural resources, agriculture research and environment, chaired by Rep. James H. Scheuer (D.-N. Y.).

"In late 1981 Comsat sought to identify appropriate senior executive prospects to meet its developing organizational needs," a Comsat official said. "A number of individuals were brought to the attention of the corporation and discussions were arranged with several."

Fiske was included in those discussions while he was under secretary of the Energy Dept. from September, 1981, to Apr. 8, 1982, and also after he assumed his current post at the Commerce Dept., for which he was confirmed on June 24, 1982, Comsat officials said.

Comsat also said last week that no job offer was made to Fiske, who also denied this claim.

"I have no intention of leaving Commerce for Comsat and never did," Fiske said. "I was never offered a position with Comsat.

"I managed the satellite transfer proposal only in terms of meeting deadlines for reports to Secretary Malcolm Baldrige. He made the decisions and reviewed the alternatives, and all the policy work was done at the National Oceanic and Atmospheric Administration."

Congressional Control

New legislation has been introduced to give Congress control over the satellite transfer proposal. One bill, House Resolution 2507 by Rep. Ike Skelton (D.-Mo.), was aimed at hindering the proposal, a member of the staff said.

The bill requires the proposal to win approval in both the House and the Senate, and in addition must be considered by Agriculture, Science and Armed Services committees in both the House and the Senate.

Sen. Slade Gorton (R.-Wash.), chairman of the science, technology and space subcommittee of the Senate Commerce, Science and Transportation Committee, introduced an amendment to the National Aeronautics and Space Administration budget requiring consultation on the proposal with his committee before the Commerce Dept. proceeds.

Before joining the Energy Dept., Fiske was executive vice president for commercial sales and a director of General Dynamics Corp., St. Louis, beginning in 1977. He also served as chairman of Asbestos Corp., Ltd., a Montreal-based, partially owned subsidiary of General Dynamics.

During 1968 to 1977 Fiske held various executive positions with International Telephone & Telegraph. He also has held positions with Automotive Products Group, North America, and with General Electric Co.

Delayed Action

Commerce Dept. officials said last week they have no intention of slowing action in Congress by temporarily withdrawing the proposed transfer of weather and Landsat satellites, despite the opposition and questions about the role Comsat may have played in the final decision.

A request for proposals for private operation of the satellites will be drafted in June and sent to industry in the fall. The ability of interested firms that answer the request to address the concerns heard from members of Congress will determine if the Commerce Dept. proceeds to seek legislation that would allow the sale, a department official said.

Memos from the Commerce Dept. show meetings crucial to the eventual decision to include weather satellites in a transfer proposal that already contained Landsat satellites were taking place in the spring of 1982 between Commerce Dept. and Comsat officials. That is also the period in which Comsat officials were exploring their future personnel needs in the executive ranks.

The eventual decision to commercialize the satellites was not made until Mar. 8, 1983.

Late last week staff for the Scheuer subcommittee requested personal desk calendars and telephone logs from Fiske and Associate Deputy Commerce Secretary Michael J. Boyer but received them only from Boyer.

The ranking Republican on the subcommittee, Rep. Raymond McGrath (R.-N. Y.), is satisfied that Boyer and Fiske and their staffs have been taken off the issue and no longer feels there is a need for the investigation to continue.

McGrath is strongly opposed to transfer of weather satellites to the private sector and doubts there is sufficient market for Landsat data to justify transfer, an aide said. □

ATTACHMENT W

DON FUQUA (Fla.), Chairman
ROBERT A. ROE, N.J.
GEORGE E. BROWN, JR., CALIF.
JAMES H. SCHEUER, N.Y.
RICHARD L. OTTINGER, N.Y.
TOM HARKIN, IOWA
MARILYN LLOYD, TENN.
DOUG WALGREN, PA.
DAN GLICKMAN, KANS.
ALBERT GORE, JR., TENN.
ROBERT A. YOUNG, MO.
HAROLD L. VOLKMER, MO.
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STANLEY N. LUNDINE, N.Y.
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PAUL SIMON, ILL.
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RICHARD J. DURBIN, ILL.
MICHAEL A. ANDREWS, TEX.
BUDDY MAC KAY, FLA.
TIM VALENTINE, N.C.
MARY ROSE OAKAR, OHIO
ROBERT G. TORRICELLI, N.J.
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TOM LEWIS, FLA.

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUITE 2321 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, D.C. 20515
(202) 225-6371

J. H. PEOPLES
Executive Director
ROBERT C. KETCHAM
General Counsel
DAVID D. JEFFERY
Minority Staff Director

April 27, 1983

Dr. Joseph V. Charyk
President and Chief Executive Officer
Communications Satellite Corporation
950 L'Enfant Plaza, S.W.
Washington, D.C. 20024

Dear Dr. CHaryk:

The Subcommittee on Natural Resources, Agriculture Research and Environment is presently conducting an inquiry into events surrounding the relationship between COMSAT and the Commerce Department during the past two years. Central to this inquiry are Deputy Secretary of Commerce Fiske's contacts with COMSAT, both in terms of the commercialization of civil satellite systems and in terms of employment opportunities with your corporation.

In order that we may fully evaluate this matter, we would appreciate it if you would provide us with the following information:

1) The names and titles of all COMSAT officials who met or talked with Mr. Fiske concerning (a) the commercialization of the civilian satellite systems and (b) possible employment with COMSAT. We also request the dates and locations of those meetings or discussions.

2) The specific position for which Mr. Fiske was being considered.

3) The names of any executive placement service which may have served as an intermediary or conduit between your corporation and Mr. Fiske concerning employment.

In addition, we request that you provide the Subcommittee with copies of all correspondence, memoranda, papers and documents pertaining to or otherwise discussing Mr. Fiske's possible employment with COMSAT and any material prepared or presented to Mr. Fiske concerning the commercialization of the civilian satellite systems.

Deputy Secretary Fiske will be appearing before a joint hearing of Science and Technology subcommittees on Thursday, May 5, 1983. In order to prepare properly for this hearing we respectfully request the above information be submitted by Close of Business on Monday, May 2, 1983.

Sincerely,

JAMES H. SCHEUER, M.C.
Chairman, Subcommittee on
Natural Resources, Agriculture
Research and Environment

DON FUQUA (Fla.), Chairman

ROBERT A. ROE, N.J.
GEORGE E. BROWN, JR., CALIF.
JAMES H. SCHEUER, N.Y.
RICHARD L. OTTINGER, N.Y.
TED WEISS, N.Y.
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April 27, 1983

Honorable Malcolm Baldrige
Secretary of Commerce
U.S. Department of Commerce
14th Street & Constitution Avenue
Washington, D. C. 20230

Dear Secretary Baldrige:

The Subcommittee on Natural Resources, Agriculture Research and the Environment is presently conducting an inquiry into Deputy Secretary Guy W. Fiske's contacts with COMSAT, both in terms of the commercialization of civil satellite systems and in terms of employment opportunities. In the course of your April 14th testimony before this Subcommittee, you indicated that following a review by the General Counsel, it was determined that Mr. Fiske and his immediate office should be recused from further involvement with this issue.

In order that we may fully evaluate this matter we would appreciate it if you would provide us with the following information:

1) The date on which Mr. Fiske first advised you of his conversations with COMSAT regarding employment; the individuals present during this discussion; and the nature of the conversation.

2) The date on which you referred this matter to the General Counsel, the member (or members) of the General Counsel's staff who participated in the review of Mr. Fiske's activities, and the names of any individuals consulted, contacted, or interviewed by the General Counsel's office in the course of this review.

3) The date on which Mr. Fiske was advised that he should recuse himself; the names of the individuals in Mr. Fiske's office who were also recused; and the names of any individuals who participated in any meetings concerning this recusal.

In addition, we request that you provide the Subcommittee with copies of all records, correspondence, memoranda, papers and documents pertaining to, commenting upon or otherwise discussing Mr. Fiske's possible employment with COMSAT and his recusal from further involvement with the commercialization of the civilian satellite systems.

Deputy Secretary Fiske will be appearing before a joint hearing of Science and Technology subcommittees on Thursday, May 5, 1983. In order to prepare properly for this hearing, we respectfully request the above information be submitted by Close of Business on Friday, April 29, 1983.

Sincerely,

JAMES H. SCHEUER, M.C.
Chairman, Subcommittee on
Natural Resources, Agriculture
Research and the Environment

DON FUQUA (Fla.) Chairman

ROBERT A. ROE, N.J.
GEORGE E. BROWN, JR., CALIF.
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April 27, 1983

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TOM LEWIS, FLA.

J. M. POORE
Executive Director
ROBERT C. KETCHAM
General Counsel
DAVID S. JEFFERY
Minority Staff Director

Honorable Guy Fiske
Deputy Secretary
U.S. Department of Commerce
14th Street and Constitution Avenue
Washington, D. C. 20230

Dear Secretary Fiske:

As you are aware, the Natural Resources, Agriculture Research and Environment Subcommittee is reviewing all of the circumstances surrounding the relationship between COMSAT and Commerce Department officials. In furtherance of this examination, we have requested a specific listing of the names of COMSAT officials with whom you met regarding employment with that corporation and the dates of those meetings. Your attorney, Mr. Davenport, has expressed some question as to who is responsible for preparing this material. To remove any lingering doubts as to the information we would like from you, we request that you provide the Subcommittee the following:

1) The names of all COMSAT officials you met with concerning employment and the dates and locations of those meetings;

2) The names of any individuals representing an executive placement service that may have served as an intermediary or conduit regarding possible employment with COMSAT;

3) The names of all COMSAT officials with whom you met or spoke by telephone concerning the commercialization of the civilian satellite systems and the dates of those meetings or conversations.

In addition, we request that you provide the Subcommittee with copies of all correspondence, memoranda, papers and documents pertaining to or discussing possible employment with COMSAT. Included within this request are copies of all correspondence with any executive placement service concerning employment with COMSAT.

As you know, at your attorney's request, we have rescheduled your appearance before a joint hearing of Science and Technology subcommittees to Thursday, May 5, 1983. In order to prepare properly for this hearing,we respectfully request the above information be submitted by Close of Business on Friday, April 29, 1983.

Sincerely,

JAMES H. SCHEUER, M.C.
Chairman, Subcommittee on
Natural Resources, Agriculture
Research and Environment

c.c. James P. Davenport

20-901 O - 84 - 97

ATTACHMENT X

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DAVID B. WILKINS

LUCIEN HILMER
OF COUNSEL

April 29, 1983

The Honorable James H. Scheuer
U.S. House of Representatives
2402 Rayburn House Office Building
Washington, D.C. 20515

Re: Deputy Secretary of Commerce Guy W. Fiske

Dear Congressman Scheuer:

On behalf of Deputy Secretary Fiske, we submit the following information in response to your letter of April 27, 1983:

(1) The names of all COMSAT officials you met with concerning employment and the dates and locations of those meetings.

Mr. Fiske met with Dr. Joseph V. Charyk, President, and Mr. John D. Harper, Chairman of Comsat, as follows:

March 17, 1982. Mr. Fiske met with Dr. Charyk at the L'Enfant Plaza Hotel in, we believe, the late afternoon.

March 23, 1982. Mr. Fiske had lunch with Dr. Charyk at the L'Enfant Plaza.

May 4, 1982. Mr. Fiske had lunch with Dr. Charyk and Mr. Harper at Comsat headquarters.

November 5, 1982. The last meeting, between Mr. Fiske and Mr. Charyk, was again at the L'Enfant Plaza.

(2) The names of any individuals representing an executive placement service that may have served as an intermediary or conduit regarding possible employment with COMSAT.

Mr. Fiske was first contacted concerning the possibility of a position at Comsat by Mr. R. Blair Murphy of

Spencer Stuart & Associates, we believe in early March 1982. Mr. Murphy attended two of the meetings between Mr. Fiske and Dr. Charyk, and there were several telephone conversations between Mr. Murphy and Mr. Fiske both before and after these meetings.

(3) The names of all COMSAT officials with whom you met or spoke by telephone concerning the commercialization of the civilian satellite systems and the dates of those meetings or conversations.

Mr. Fiske met with Mr. James Lynn, who represented Comsat on the commercialization issue, on two occasions in Mr. Fiske's office, July 29, 1982, and November 30, 1982. Assistant Deputy Secretary Michael Bayer attended both meetings, although Secretary Baldrige called Mr. Fiske out of the November 30, 1982 meeting about five minutes after it started and he did not return. Mr. Fiske also recalls having lunch with Mr. Lynn on September 20, 1982, but not on the commercialization issue. They discussed Mr. Lynn's experiences when he was Deputy Secretary of Commerce. He believes there may have been several telephone calls to and from Mr. Lynn during this period, but he has no notes of such calls and, after inquiry, we have no way of identifying local calls from Commerce records. Finally, both Mr. Lynn and Dr. and Mrs. Charyk attended an open-house Christmas party (with about 120 others) at the Fiske's home on December 18, 1982.

As regards your request for additional documents, we have a letter from Mr. Murphy to Mr. Fiske on March 28, 1983, which states that it is a "sign-off on the opportunity at Comsat." A copy is enclosed. No employment negotiations occurred between Mr. Fiske and Comsat and their general discussions on the possibility of future employment ended when Comsat filled its needs from inside the company.

Mr. Fiske wrote courtesy letters to Dr. Charyk following their March 23 and November 5, 1982 meetings, essentially thanking him for the luncheons and discussions. We enclose a copy of Mr. Fiske's letter of March 26, 1982; we have not located a copy of the letter following the November 5 lunch, but we are continuing our search for that letter. Mr. Fiske wrote two letters to Dr. Charyk concerning two social events. Copies are enclosed. We also enclose a letter Mr. Fiske wrote to Mr. Lynn, thanking him for lunch. Apart from the entries in his

calendars, which we furnished to your staff, the only note we have found concerning Mr. Fiske's contact with Comsat on the matter of employment is a note that he wrote when Mr. Fiske was still at Energy, a copy of which is enclosed.

We appreciate your courtesy in rescheduling the hearing. Again, if you and/or your staff wish to discuss any of these matters in advance of the scheduled hearing, Mr. Fiske is available.

Very truly yours,

James P. Davenport

JPD/lcg

Enclosures

cc: Congressman Harold L. Volkmer
Congressman Manuel Lujan, Jr.
Congressman Don Fuqua
Congressman Larry Winn, Jr.
Congressman William D. Lowery
(w/Enclosures)

DEPARTMENT OF ENERGY
WASHINGTON, DC 20585

Under Secretary

ComSat →

→ no clear charter from Congress - ~~controlled~~ by FCC →

Very political animal -

Don't pay their people well.

Neoplytes re marketing software.

DEPARTMENT OF ENERGY
WASHINGTON, DC 20585

Under Secretary

Expert on regulation —
need act of Congress —
Would be Bored silly —
Cheap — Tough —
bureaucratic politician

THE UNDER SECRETARY OF ENERGY
WASHINGTON, D.C. 20585

March 26, 1982

Joseph V. Charyk
President and Chief
Executive Officer
Comsat
950 L'Enfant Plaza, S. W.
Washington, D. C. 20024

Dear Dr. Charyk;

Thank you for the pleasant luncheon and discussion. I was pleased to learn about your business and the several dynamic new opportunities planned for the future.

I will look forward to hearing from you.

Sincerely,

Guy Fiske

9/21/82

Honorable James Lynn
Jones, Day, Reavis & Pogue
1735 Eye Street, N.W.
Washington, DC 20006

Dear Jim:

Thank you for the lunch and the interesting conversation. You have been very helpful and I appreciate your interest.

I will have Nancy check with your office to schedule a luncheon here at the Commerce Department, which will give me a chance to gather additional knowledge from your experience.

Sincerely,

Guy W. Fiske
Deputy Secretary

THE DEPUTY SECRETARY OF COMMERCE
WASHINGTON, D.C. 20230

November 9, 1982

Dr. and Mrs. J. V. Charyk
5126 Tilden Street, N. W.
Washington, D. C. 20008

Dear Joe and Edwina:

Jackie and I enjoyed being with you Saturday night at the Heart Ball. We thank you for including us.

Knowing what a contribution you and COMSAT have made to your field of business and to the nation, I was not surprised to learn that even the medical field has benefitted.

We look forward to seeing you both again.

Sincerely,

Guy W. Fiske

1510

THE DEPUTY SECRETARY OF COMMERCE
WASHINGTON, D.C. 20230

January 11, 1983

Dr. Joseph Charyk
5126 Tilden Street, N.W.
Washington, D. C. 20016

Dear Joe:

My secretary advises that you and Mrs. Charyk invited Jackie and me to the Virginia Slims tennis championship finals. We had already accepted another invitation and were sorry that we had to regret, but we appreciate your thoughtfulness in asking us.

Jackie and I look forward to seeing you and Edwina soon.

With best personal regards.

Sincerely,

Guy W. Fiske

Spencer Stuart & Associates

Stamford

THREE LANDMARK SQUARE
STAMFORD, CONNECTICUT 06901
TEL: (203) 324-6333 TELEX: 996-444

March 28, 1983

Mr. Guy W. Fiske
1323 Merrie Ridge Road
McLean, VA 22101

Dear Guy:

I want to confirm the sign-off on the opportunity at Comsat. This is a very complicated situation, as we have both discussed and agreed, and perhaps the resolution of our client's problem is the best that one could expect under the circumstances.

I wanted you to know that I enjoyed the opportunity to get to know you and consider you a friend. I am only sorry that we will not have a reason to continue to communicate, and I will take you up on your invitation to visit next time I am in Washington.

When I was listening to the President the other night on his defense strategy, I couldn't help but to think of you and what I would perceive to be the significant input that you made to the content of his statements. It sounds as if we are on the right track, and you are to be congratulated for your foresight and direction.

I am aware that by now you have heard from Joe McGinley, and I hope that that situation progresses in a positive manner.

Warm regards,

R. Blair Murphy
Partner
Managing Director - Stamford Office

RBM:mm

ATTACHMENT Y

THE SECRETARY OF COMMERCE
Washington, D.C. 20230

APR 29 1983

Honorable James H. Scheuer
Chairman
Subcommittee on Natural Resources,
Agriculture Research and Environment
Committee on Science and Technology
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

I will reply to the specific requests for information contained in your letter of April 27, in the order in which the requests are presented.

(1) I was told by Mr. Fiske late on the afternoon of Friday, March 24, 1983, shortly before I left Washington for a weekend speaking tour, that he had discussed with officers of COMSAT the possibility of his employment by COMSAT. Mr. Fiske and I were alone during this conversation. The impression left with me by Mr. Fiske's remarks was that his conversations with COMSAT were preliminary in nature.

(2) At 9:30 a.m., Monday, March 28, 1983, I discussed with Mr. Margulies, the Department's Deputy General Counsel, how Mr. Fiske's relationship with COMSAT would affect his participation in the Department's work on the commercialization of NOAA's land and weather satellites. I informed Mr. Margulies that, in view of what we had learned of Mr. Fiske's relationship with COMSAT, I, not Mr. Fiske, would present the Department's program for transferring NOAA's land and weather satellites to the private sector at a Congressional hearing scheduled for April 14. On March 30, I asked my Executive Assistant Helen Robbins to contact Sherman Unger, our General Counsel. Mr. Unger was then in the Far East on official travel. We scheduled a meeting for Tuesday April 5, the day he was due to return to duty in the USA. Mr. Unger is the Department's Designated Agency Ethics Official under the Ethics in Government Act and I wanted his advice regarding the application of that Act and the Department's Standards of Conduct to the activities which Mr. Fiske reported to me.

At different times during April 5, the General Counsel and the Deputy General Counsel and the General Counsel and I discussed the further response to be made to Mr. Fiske's relationship with COMSAT. After these discussions, I decided on April 5 to ask Mr. Fiske to recuse himself and all those in his immediate office from any work on or in connection with the commercialization of NOAA's weather and land satellites. I also asked the General Counsel to confirm with a written opinion his view of the appropriateness of the recusal as a response to the facts revealed to me by Mr. Fiske.

(3) I advised Mr. Fiske that he should recuse himself in a conversation I had with him on April 5. I directed the Deputy General Counsel to draft the recusal and have it executed. Only Mr. Fiske, Mr. Unger, Mr. Margulies and I participated in meetings concerning this recusal before it was executed. At my direction Mr. Calio, who on April 6 was Acting Administrator of NOAA, (John Byrne was in China), was informed of the recusal as soon as it was executed. On April 8, Mr. Margulies met with Mr. Michael Bayer, Associate Deputy Secretary and Mr. Michael Kelly, a consultant with the Department, and informed Mr. Kelly that all those in Mr. Fiske's immediate office were recused from any work on or in connection with the commercialization of the NOAA weather and land satellites.

Enclosed are the Department records, correspondence, memoranda, papers and documents dealing with Mr. Fiske's relationship with COMSAT and his recusal from further involvement with the commercialization of NOAA's land and weather satellites.

Sincerely,

Malcolm Baldrige

Secretary of Commerce

Enclosures

April 6, 1983

MEMORANDUM FOR: Staff of the Deputy Secretary

FROM: Guy W. Fiske

SUBJECT: Recusal

I have recused myself and all those in my immediate office from any work on or in connection with the commercialization of the NOAA land and weather satellites. Avoid any involvement in these matters.

GENERAL COUNSEL OF THE
UNITED STATES DEPARTMENT OF COMMERCE
Washington, D.C. 20230

13 APR 1983

MEMORANDUM TO THE SECRETARY

FROM: Sherman E. Unger /s/
General Counsel

SUBJECT: Personal Outside Contacts During Planning Stages of Satellite Transfer Project

You have asked whether meetings between Deputy Secretary Fiske and senior officials of the COMSAT Corporation during Departmental consideration of the feasibility of transfer of the LANDSAT and METSAT systems to the private sector violated the Department's Standards of Conduct. (15 CFR Part 0.735)

Mr. Fiske has told you that during the period August 1982 through February 1983, he discussed possible employment with COMSAT officials on one or more occasions. He has told you that these conversations regarding employment were preliminary in nature and did not ripen into an arrangement for future employment or negotiations for a present job.

Section 0.735-10a of the Department's Standards of Conduct list the following "proscribed actions":

> An employee shall avoid any action whether or not specifically prohibited by [law or regulation] which might result in or create the appearance of:
>
> (a) Using public office for private gain;
>
> (b) Giving preferential treatment to any person;
>
> * * *
>
> (d) Losing complete independence or impartiality; (Emphasis added)
>
> * * *

Mr. Fiske's discussion of employment with a company that expressed a high degree of interest in the purchase of NOAA's land and weather satellite systems while he had managerial responsibility for Departmental involvement in actions which could lead to a recommendation to the President for sale or transfer of that system violated the above quoted prohibitions. By his actions he created the appearance of (a) using public office for private gain; (b) giving

preferential treatment to the corporation; and (c) losing complete independence or impartiality.

Because of his conduct, which has created the appearance of conflict, you have asked Mr. Fiske to avoid any further involvement in the proposed LANDSAT or METSAT transfers. On April 7, 1983, Mr. Fiske formally recused himself and his staff from involvement in any matter relating to the project.

It is our opinion that your request for the recusal action by Mr. Fiske was an appropriate response to these facts. Actual conflict of interest does not appear to exist in this case. There was no particular matter Mr. Fiske was responsible for which could affect the financial interest of LANDSAT during the time of the employment conversations. Nor do we understand that the conversations between Mr. Fiske and COMSAT reached the point where a job was promised, or the terms of a particular job negotiated.

The appropriate official response to appearance of conflict violations requires the exercise of judgement and discretion on the part of the responsible department official. Mr. Fiske is now aware of the serious complications his actions have caused the Department. His recusal addresses, as far as one now can, the appearance problem his action created. Section 0.735.40 of the Department's Standards of Conduct suggests a range of penalties and remedial actions which the responsible Departmental official may take in response to violations of the Standards. Your action was consistent with these guidelines. No further action is legally required.

Prepared by:OGC/Admin:MWagner/rs:df:4/13/83
bc: Signer(2):Wagner/White:MWagner:Chron:CGCFile
Title: Personal Contacts

GEORGE E. BROWN, JR. CALIF.
JAMES H. SCHEUER, N.Y.
RICHARD L. OTTINGER, N.Y.
TOM HARKIN, IOWA
MARILYN LLOYD, TENN.
DOUG WALGREN, PA.
DAN GLICKMAN, KANS.
ALBERT GORE, JR., TENN.
ROBERT A. YOUNG, MO.
HAROLD L. VOLKMER, MO.
BILL NELSON, FLA.
STANLEY N. LUNDINE, N.Y.
RALPH M. HALL, TEX.
DAVE MC CURDY, OKLA.
NORMAN Y. MINETA, CALIF.
RICHARD J. DURBIN, ILL.
MICHAEL A. ANDREWS, TEX.
BUDDY MAC KAY, FLA.
TIM VALENTINE, N.C.
BARRY M. KEIO, NEV.
ROBERT G. TORRICELLI, N.J.
FREDERICK C. BOUCHER, VA.

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUITE 2321 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, D.C. 20515
(202) 225-6371

D. JAMES BENNINGHOVEN, JR., OHIO
JUDD GREGG, N.H.
RAYMOND J. MC GRATH, N.Y.
JON GREEN, N. DAK.
CLAUDINE SCHNEIDER, R.I.
BILL DWYER, CALIF.
POD CHANDLER, MASS.
HERBERT H. BATEMAN, VA.
SHERWOOD L. BOEHLERT, N.Y.
ALFRED A. MC CANDLESS, CALIF.
TOM LEWIS, FLA.

J. N. POORE
Executive Director
ROBERT C. KETCHAM
General Counsel
DAVID S. JEFFERY
Minority Staff Director

APR 19 3 55 PM '83

April 18, 1983

Honorable Malcolm Baldrige
Secretary
U.S. Department of Commerce
Washington, D.C. 20230

Dear Mr. Secretary:

I want to take this opportunity to thank you for your forthright and illuminating testimony last Thursday before the Science and Technology subcommittees which Representative Volkmer and I chair. We very much appreciated the opportunity this joint hearing gave us to begin exploring the Administration's announced intention to sell the government's weather satellites. I would also like to clarify one or two points that came up during your testimony.

The Natural Resources, Agriculture Research and Environment Subcommittee has requested copies of personal and desk calendars and telephone logs for Deputy Secretary Guy Fiske and Assistant Deputy Secretary Michael Bayer. In addition, you indicated that you would furnish us with a specific listing of the names of COMSAT officials with whom the Deputy Secretary or Assistant Deputy Secretary met regarding employment with COMSAT and the dates of those meetings, as well as a specific listing of the names and dates of their meetings with COMSAT regarding the sale of weather satellites.

Mr. Secretary, I want to emphasize the seriousness with which we view the implications of these meetings. While I can appreciate the fact that you are ultimately responsible for policy decisions in your Department and that you had no knowledge of the specifics of the employment-oriented meetings, I am sure you can understand our desire to examine closely the sequence of events involving the Deputy Secretary and the Assistant Deputy Secretary. In order for us to discharge thoroughly our Constitutionally mandated oversight function, we must be able to examine all of the circumstances which may have affected government policy on the weather satellite sale, particularly in light of the serious national security considerations and potentially heavy cost to the taxpayers.

Investigators from my subcommittee were told by several individuals in your Department on Friday that discussions were underway between the White House and Commerce officials regarding the possible departure of Mr. Fiske from his position as Deputy Secretary.

I want to emphasize that whatever the ultimate disposition of these reports, the Natural Resources, Agriculture Research and Environment Subcommittee will continue its examination of all the events surrounding the relationships between COMSAT and Commerce Department officials during the past two years. It is our intention to call Mr. Fiske, Mr. Bayer and others as witnesses before a joint hearing of the subcommittees at the earliest possible date.

Your continued cooperation and assistance in these matters is greatly appreciated.

With every warm best wish,

Sincerely,

JAMES H. SCHEUER
Chairman, Subcommittee on
Natural Resources, Agriculture
Research and Environment

JHS/Pkm

GENERAL COUNSEL OF THE
UNITED STATES DEPARTMENT OF COMMERCE
Washington, D.C. 20230

April 18, 1983

MEMORANDUM FOR Sherman E. Unger
General Counsel

FROM: Irving P. Margulies
Deputy General Counsel

Mr. Fiske told me of his employment interview with COMSAT on Friday, March 25, 1983. At that time, he told me he had already informed the Secretary about the interview.

I immediately informed Tom Collamore of this conversation (the Secretary and Helen were not in the office on that date) and asked to see the Secretary.

I was put on the Secretary's calendar for 9:30 a.m., Monday, March 28, 1983. Helen Robbins and Tom Collamore discussed with me at 9:00 a.m., Monday, March 28 the subject of the 9:30 a.m. meeting with the Secretary.

At the 9:30 a.m. meeting with the Secretary, I told him that, based on the information given me by Mr. Fiske on Friday, it was my recommendation that he, rather than Mr. Fiske, testify at the scheduled hearing on April 14.

GENERAL COUNSEL OF THE
UNITED STATES DEPARTMENT OF COMMERCE
Washington, D.C. 20230

April 27, 1983

Honorable Guy W. Fiske
Deputy Secretary
Department of Commerce
Washington, D.C. 20230

Dear Guy,

Enclosed is a letter sent to Secretary Baldrige on April 27.

I have been informed that the Subcommittee has addressed to you a letter requesting copies of records, correspondence, memoranda, papers and documents concerning your possible employment with COMSAT. As we have previously requested, please supply to us a copy of any material you submit to the Subcommittee.

We appreciate your prior cooperation in this procedure.

Sincerely,

Irving P. Margulies

Irving P. Margulies
Deputy General Counsel

Enclosure

DON FUQUA (Fla.) Chairman

ROBERT A. ROE, N.J.
GEORGE E. BROWN, JR., CALIF.
JAMES H. SCHEUER, N.Y.
RICHARD L. OTTINGER, N.Y.
TOM HARKIN, IOWA
MARILYN LLOYD, TENN.
DOUG WALGREN, PA.
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PAM, BYRNS, TEX.
NORMAN Y. MINETA, CALIF.
RICHARD J. DURBIN, ILL.
MICHAEL A. ANDREWS, TEX.
BUDDY MAC KAY, FLA.
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MARY M. REID, NEV.
ROBERT G. TORRICELLI, N.J.
FREDERICK C. BOUCHER, VA.

LARRY WINN, JR., KANS.
WENDELL BAILEY, MO.
ROBERT S. WALKER, PA.
WILLIAM CARNEY, N.Y.
F. JAMES SENSENBRENNER, JR., WIS.
JUDD GREGG, N.H.
RAYMOND J. MC GRATH, N.Y.
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ROD CHANDLER, WASH.
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WASHINGTON, D.C. 20515
(202) 225-6371

April 27, 1983

Honorable Malcolm Baldrige
Secretary of Commerce
U.S. Department of Commerce
14th Street & Constitution Avenue
Washington, D. C. 20230

Dear Secretary Baldrige:

The Subcommittee on Natural Resources, Agriculture Research and the Environment is presently conducting an inquiry into Deputy Secretary Guy W. Fiske's contacts with COMSAT, both in terms of the commercialization of civil satellite systems and in terms of employment opportunities. In the course of your April 14th testimony before this Subcommittee, you indicated that following a review by the General Counsel, it was determined that Mr. Fiske and his immediate office should be recused from further involvement with this issue.

In order that we may fully evaluate this matter we would appreciate it if you would provide us with the following information:

1) The date on which Mr. Fiske first advised you of his conversations with COMSAT regarding employment; the individuals present during this discussion; and the nature of the conversation.

2) The date on which you referred this matter to the General Counsel, the member (or members) of the General Counsel's staff who participated in the review of Mr. Fiske's activities, and the names of any individuals consulted, contacted, or interviewed by the General Counsel's office in the course of this review.

3) The date on which Mr. Fiske was advised that he should recuse himself; the names of the individuals in Mr. Fiske's office who were also recused; and the names of any individuals who participated in any meetings concerning this recusal.

In addition, we request that you provide the Subcommittee with copies of all records, correspondence, memoranda, papers and documents pertaining to, commenting upon or otherwise discussing Mr. Fiske's possible employment with COMSAT and his recusal from further involvement with the commercialization of the civilian satellite systems.

Deputy Secretary Fiske will be appearing before a joint hearing of Science and Technology subcommittees on Thursday, May 5, 1983. In order to prepare properly for this hearing, we respectfully request the above information be submitted by Close of Business on Friday, April 29, 1983.

Sincerely,

JAMES H. SCHEUER, M.C.
Chairman, Subcommittee on
Natural Resources, Agriculture
Research and the Environment

THE SECRETARY OF COMMERCE
Washington, D.C. 20230

27 APR 1983

Honorable James H. Scheuer
Chairman
Subcommittee on Natural Resources,
Agriculture Research and Environment
Committee on Science and Technology
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

This in in reply to your letter of April 18.

The materials concerning the activities of Associate Deputy Secretary Bayer which you requested were furnished to your staff on April 21. I have been informed that your staff and Mr. Fiske's counsel have discussed the materials concerning the activities of Deputy Secretary Fiske which you requested and that these materials will be furnished to your staff on April 26.

Your letter refers to discussions "between the White House and Commerce officials regarding the possible departure of Mr. Fiske from his position as Deputy Secretary." There have been no such discussions.

I appreciate the opportunity the hearings before the Science and Technology Committee provided me to present the Administration's program for commercialization of NOAA's land and weather satellites. I want to assure you again of my full and continued cooperation with the Congress as we proceed with our program.

Sincerely,

/S/

Secretary of Commerce

ATTACHMENT 2

COMMUNICATIONS SATELLITE CORPORATION

A. P. STATHAM
Vice President
Corporate Affairs

May 2, 1983

The Honorable James H. Scheuer
Chairman, Subcommittee on
Natural Resources, Agriculture
Research and Environment
Committee on Science and Technology
U.S. House of Representatives
Suite 2321 Rayburn House Office Building
Washington, D.C. 20515

Dear Congressman Scheuer:

Dr. Charyk has asked me to provide the information that you requested in your letter of April 27, 1983.

First, you requested the names and titles of all Comsat officials who met or talked with Mr. Fiske concerning (a) the commercialization of civilian satellite systems, and (b) employment opportunities with Comsat. You also requested the dates and locations of the meetings or discussions. Attachment 1 contains, to the best of our ability to reconstruct within the time set to respond to your request, the names and titles of Comsat officials who met or talked to Mr. Fiske concerning commercialization of civilian satellite systems, together with the dates and locations of those meetings or discussions. We note for your information that Mr. Lynn of Jones, Day, Reavis & Pogue, counsel for Comsat and Comsat General Corp., who is not a Comsat official, had communications with Mr. Fiske concerning commercialization of civilian satellite systems, but not concerning any employment opportunities.

The only Comsat officials who met or talked with Mr. Fiske concerning employment opportunities with Comsat were Dr. Charyk, President and Chief Executive Officer, and John D. Harper, Chairman of the Board of Directors.

950 L'ENFANT PLAZA, SW • WASHINGTON, D.C. 20024 • TELEPHONE (202) 863-6446

Attachment 2 contains, to the best of our ability to reconstruct within the time set to respond to your request, the dates and places of meetings or discussions between Dr. Charyk or Mr. Harper and Mr. Fiske concerning employment opportunites with Comsat. We note for your information that there were additional social contacts and contacts relating to an international trade exhibition in China between Dr. Charyk and Mr. Fiske that had no connection with employment opportunities with Comsat. There may have been a brief reference to commercialization of government civilian satellite systems at one or more of these meetings, but Dr. Charyk cannot recall the dates or places of the references, if any, and does not recall any detailed discussions of that subject with Mr. Fiske.

Second, you requested the specific position for which Mr. Fiske was being considered. Dr. Charyk and Mr. Harper met with Mr. Fiske in the process of attempting to identify from both inside and outside the ranks of existing Comsat employees possible successors to Dr. Charyk as President of Comsat. Dr. Charyk thought of two positions, first a Vice President for Finance and Administration and subsequently Executive Vice President, as possible steps toward succession to the position of President. He requested the executive search firm named below to identify potential candidates, first for the position of Vice President for Finance and Administration and then for the position of Executive Vice President. The executive search firm brought Mr. Fiske to Dr. Charyk's attention as a potential candidate for the position of Executive Vice President. Comsat never determined whether Mr. Fiske was an appropriate candidate for employment by Comsat, or what position, if any, Mr. Fiske might fill because Dr. Charyk never reached the point of deciding to recommend to the Comsat Board the employment of Mr. Fiske. No offer of employment for any position was ever extended to Mr. Fiske by Comsat.

Third, you requested the names of any executive placement service which may have served as an intermediary or conduit between your corporation and Mr. Fiske concerning employment. R. Blair Murphy of the executive search firm of Spencer Stuart & Associates of Stamford, Connecticut was retained by Comsat in August 1981 to help in the search for appropriate candidates for a possible successor to Dr. Charyk. Mr. Murphy brought Mr. Fiske to Dr. Charyk's attention on or about March 4, 1982 and participated in discussions of employment opportunities with Comsat.

You requested copies of all correspondence, memoranda, papers and documents pertaining to or otherwise

discussing Mr. Fiske's possible employment with Comsat. We are aware of only six documents (excluding Dr. Charyk's logs which reflect the dates in Attachment 2) that may be responsive to this request. These documents are enclosed as Attachment 3.

Finally, you requested any materials prepared or presented to Mr. Fiske concerning the commercialization of the civilian satellite systems. We, of course, have no way of knowing what might have been presented to Mr. Fiske by other persons and have construed your request to encompass only material prepared by Comsat for Mr. Fiske or presented by Comsat to Mr. Fiske. These documents are enclosed as Attachment 4.

We believe that this material is fully responsive to your request. If we can be of further assistance, please contact me directly.

Sincerely,

A. P. Statham

A. P. Statham

Attachment 1 - Dates and locations of meetings or conversations by Comsat officials with Mr. Fiske concerning commercialization of civilian satellite systems.

Date	Place	Persons Present
July 29, 1982	Commerce Department	Messrs. */ Fiske Bayer, Byrne, Maughan **/ Burnett ***/

---

*/ James T. Lynn of Jones, Day, Reavis & Pogue, counsel for Comsat and Comsat General Corp., was also present.

**/ Paul M. Maughan, Earthstar Project Director, Comsat General Corp.

***/ Dennis J. Burnett, General Attorney, Comsat General Corp.

Attachment 2 - Dates and locations of meetings or conversations by Comsat officials with Mr. Fiske concerning possible employment

Date	Place	Persons Present
March 17, 1982	L'Enfant Plaza Hotel	Messrs. Fiske, Charyk, Murphy
March 23, 1982	Comsat Headquarters	Messrs. Fiske, Charyk
May 4, 1982 */	Comsat Headquarters	Messrs. Fiske, Charyk, Harper
November 5, 1982	L'Enfant Plaza Hotel	Messrs. Fiske, Charyk, Murphy

*/ This meeting was scheduled for April 20, 1982 and postponed because of scheduling difficulties.

Attachment 3 - Listing of correspondence, memoranda, papers and documents pertaining to or otherwise discussing Mr. Fiske's possible employment with Comsat

1. Letter, dated August 17, 1981 from R. Blair Murphy to Dr. Charyk.

2. Letter from Dr. Charyk to R. Blair Murphy, dated September 9, 1981.

3. Letter, dated March 4, 1982 from R. Blair Murphy to Dr. Charyk, with attached resume.

4. Letter, dated March 26, 1982 from Mr. Fiske to Dr. Charyk.

5. Letter dated May 5, 1982 from Mr. Fiske to Dr. Charyk.

6. Letter, dated November 3, 1982 from R. Blair Murphy to Dr. Charyk with attachments. The attachments are confidential reports on Mr. Fiske's abilities from former employers. Comsat requests that they be accorded confidential treatment by the Committee and not released to the public.

Attachment 3-1

Spencer Stuart & Associates Stamford
THREE LANDMARK SQUARE
STAMFORD CONNECTICUT 06901
TEL. (203) 324-6333 TELEX 996 444

202-863-6032
Barbara

Personal & Confidential

August 17, 1981

Dr. Joseph V. Charyk
Chairman and Chief Executive Officer
Communications Satellite Corporation
950 L'Enfant Plaza
Washington, D.C. 20024

Dear Joe:

We enjoyed our meeting with you last week and look forward to undertaking a search for an Executive Vice President, Finance and Administration. We are attaching a Draft Position Specification which we would appreciate having you review. It would also be helpful if we could meet later at your convenience to review the document and receive guidance as to what areas should be emphasized, modified, etc.

The following will briefly outline our understanding of your need and confirm the administrative and fee arrangements for this engagement.

OUR UNDERSTANDING OF YOUR NEED

The purpose of this search is two-fold. First, you seek to reduce your span of control by consolidating management of the major staff departments (excluding legal which will continue on a direct basis to you) under one executive who will report to you. Such staff activities include finance, corporate affairs, human resources, general services, and corporate planning. All of these functions require detailed attention and it is unrealistic to have the CEO managing the major line elements, as well as providing day-to-day direction to each one of the staff areas. The second reason for the search is to provide a potential CEO successor candidate so that you and the Board will have options for future consideration. This will ensure that top management succession at ComSat does not focus exclusively on one individual.

Our Understanding of Your Need (cont'd)

Accordingly, it is important to select an individual who has the stature and broad business experience to manage the finance, corporate affairs, human resources, general services and planning activities. The successful candidate will be a seasoned, mature business executive with broad and diversified experience. Especially important will be a strong financial background with exposure to treasury, control, systems and financial and strategic planning. The individual ideally should also have been the general manager of a siginificant division or business group and possess broad general management capabilities. The individual should have had some exposure to the Washington environment and understand the nature of the company's relationships with the legislative and executive branches of government. Management experience in a large company with a significant technology content is also important. Finally, the successful candidate must have the interpersonal skills to be compatible with the Board of Directors, yourself, and down into the organization. People relationships will be crucial to the success and long-term contribution of the new executive.

TIMETABLE

Since our meeting last week, we have initiated an investigation into a list of target companies, some of which we have attached with our Position Specification. The next 4 to 6 weeks will be spent on indentification of potential prospects and in gathering qualitative information about them from knowledgeable sources. In early October we would like to meet with you and review the backgrounds of 8 to 10 people who will have been pre-screened for interest and suitability. Following that session, we will zero in on the 3 or 4 most desirable and formally present them for your review. By mid October to early November, you should be able to meet and interview specific candidates. At that point, the control of timing shifts largely to you and is a factor of how quickly you choose to review and make decisions about the candidates.

FEE ARRANGEMENTS

In conducting a search assignment, we charge a professional fee plus expenses. Our fee takes into account both the diffficulty and complexity of the search project and the level of the position being filled.

Fee Arrangements (cont'd)

For this assignment our fee will be one-third of the estimated first year total cash compensation. Our present expectation is that a base salary of $150,000 and a bonus in the range of 30% will be required to attract an individual with the qualifications you seek. That expected range will provide the basis for a minimum retainer fee on this assignment. We will bill our fee in four monthly installments unless completion occurs sooner. Our invoicing commences at the start of the assignment and any additional fee required to reflect the final accepted compensation will be submitted at the end of the assignment.

For your accounting purposes, our fee invoices will be as follows:

First installment:	$16,500
Second installment:	$16,500
Third installment:	$16,500
Fourth installment:	$16,500
Final installment:	Balance of fee adjusted to final compensation (as necessary)

Our invoices for this assignment will be identified by the project number 721-5 and will be sent to your personal attention. Our expenses will also be billed monthly at an estimated 15% of fees and will be adjusted to the actual incurred total on the final invoice.

As mentioned above, it would be helpful to meet with you at your earliest convenience to further refine the Position Specification and we will be contacting you shortly for that purpose. We are delighted to be working with you on this important assignment and look forward to its timely and successful conclusion.

Best regards.

Sincerely,

R. Blair Murphy
Vice President
Managing Director - Stamford Off

Dayton Ogden
Vice President

DO/jd
Enclosure

Spencer Stuart & Associates

Attachment 3-2

COMMUNICATIONS SATELLITE CORPORATION

JOSEPH V. CHARYK
President and Chief Executive Officer

September 9, 1981

Mr. R. Blair Murphy, Vice President
Managing Director - Stamford Office
Spencer Stuart & Associates
Three Landmark Square
Stamford, Connecticut 06901

Dear Blair:

Thank you for your letter of August 17, containing the information relative to the search effort that we discussed during my visit with you on August 11.

The only real change that I would suggest at this time is to exclude the corporate planning function from the other functions mentioned. This is a very active area at the present time and is very time-consuming. Initially, with all of the other responsibilities that would be included, I believe that it would be desirable to retain this function as a separate activity.

The companies on the target list are certainly appropriate although I suspect that the list could be larger. Some notable additions could be TRW, Ford, MA/Com, Honeywell--to mention a few.

I will look forward to getting together with you to further refine any aspects of the specification that you feel would be helpful. In its present form, I think it is quite descriptive of what we discussed and what I have in mind.

Sincerely yours,

Joseph V. Charyk

JVC:BFM

Attachment 3-3

Spencer Stuart & Associates New York

PARK AVENUE PLAZA
55 EAST 52nd STREET
NEW YORK, NY 10055
TELEPHONE 212-407-0200
TELEX 236-462

PERSONAL AND CONFIDENTIAL

March 4, 1982

Dr. Joseph V. Charyk
President and Chief Executive Officer
ComSat Corporation
950 L'Enfant Plaza, S.W.
Washington, DC 20024

Dear Joe:

Attached is our confidential executive presentation for Guy Fiske. I met with him earlier this week and he is a candidate for the upgraded position as Executive Vice President and successor to you as COO/CEO.

Guy Fiske's position with the government is quite complicated and involves stock options which he still holds for General Dynamics' equity. When he was recruited by the government to the Department of Energy position, a special agreement was approved by the Senate which allowed him to hold a part of his stock option for a limited time period. While he has already disposed of approximately 60,000 shares, the formal agreement calls for disposal of the 90,000 share balance on or before April 6, 1982. Key advisors to the President are aware of the personal dilemma he is in and his desire to hold his options. He has been advised that the administration will do everything possible to keep him in his position in the Department of Energy. He, however, is adamant that he will have to do something in order to prevent disposal of these options. He is interested in the ComSat opportunity, and our timing is both fortuitous and critical.

Mr. Fiske is a very competent businessman and an outstanding candidate for your requirements. He meets the following criteria which we developed as a framework for the upgraded and somewhat changed position:

- A trained general manager/executive from industry ...without any setbacks in his career.
- Experience in telecommunications/electronics.

- A senior executive in the sense of experience... someone who would not interfere in the progression or succession of the younger executives within ComSat, and who would be perceived as the "right choice".

- Knowledge of financials, but without hands-on chief financial officer experience.

Because of the urgency, you have probably heard of my request to schedule an appointment with you through your secretary (she doesn't know who it is with). I think that this could be handled at the L'Enfant Plaza Loews Hotel either Saturday, Monday or Tuesday (next week).

Following this meeting, if there is sufficient interest on the part of both parties, I would proceed with the full referencing evaluation. This is complicated and will expose Mr. Fiske in the Washington, D.C. and aerospace/electronic market as one who has been approached and who may be considering change. He is willing to have me do this on a selective and confidential basis if conditions are appropriate.

I will cover the status of the other two candidates I mentioned to you late last week when I talk to you on the phone. Please let me know when you want to see him. I will be at home this weekend (203-661-4878).

Warm regards,

Blair

R. Blair Murphy
Vice President

RBM/n
Enc.

Attachment 3-4

THE UNDER SECRETARY OF ENERGY
WASHINGTON, D.C. 20585

March 26, 1982

Joseph V. Charyk
President and Chief
Executive Officer
Comsat
950 L'Enfant Plaza, S. W.
Washington, D. C. 20024

Dear Dr. Charyk;

Thank you for the pleasant luncheon and discussion. I was pleased to learn about your business and the several dynamic new opportunities planned for the future.

I will look forward to hearing from you.

Sincerely,

Guy Fiske

Attachment 3-5

THE UNDER SECRETARY OF ENERGY
WASHINGTON, D.C. 20585

May 5, 1982

Dr. Joseph Charyk
President and CEO
COMSAT
950 L'Enfant Plaza, S.W.
Washington, D. C. 20024

Dear Dr. Charyk:

Thank you for the pleasant lunch yesterday. I was pleased to meet your Chairman, John D. Harper, and to get a good understanding of your business plans. Your new venture into the direct broadcast area is certainly exciting.

I look forward to meeting with you again.

Sincerely,

Guy W. Fiske

Attachment 3-6

Spencer Stuart & Associates

Stamford

THREE LANDMARK SQUARE
STAMFORD, CONNECTICUT 06901
TEL: (203) 324-6333 TELEX: 996-444

Personal & Confidential

November 3, 1982

Dr. Joseph V. Charyk
President & Chief Executive Officer
ComSat Corporation
950 L'Enfant Plaza, S.W.
Washington, D.C. 20024

Dear Joe:

We have a date with Guy Fiske on Friday at 10:00 a.m. in Washington. I have made a reservation for a room in the L'Enfant Plaza Hotel, and I will have checked in about 9:30 a.m. I will be taking the 8:00 a.m. shuttle from New York City. Why don't you check at the desk for my room number, and I will see you in the room.

You will recall that last April/May we had a number of discussions with Guy Fiske, and you advised me that you were willing to wait for him to complete his tour of duty with the Commerce Department. This was projected, at the time, to be sometime in the fall of 1982. I have talked recently with Guy Fiske, and he wants to re-energize the discussions concerning the opportunity at ComSat. I believe he will tell you on Friday that he feels his obligation is almost complete and that he is ready to move onto something different, presumably in the private sector. You confirmed in your telephone conversation with me on September 21st that the recent moves within the executive organization of ComSat took the pressure off the final move concerning a selection for your backup. We agree that this should provide us with more time to make a thorough assessment and that you have an inside candidate now.

In the context of Mr. Fiske's candidacy, I am sending along, per the attached, reference reports from four contacts I made last spring. You will note that I attempted to get at the question you raised about his balance in dealing with important business matters and change. I think he comes out of the reference process with a good report.

There are a number of other reference calls to make. These would include the following:

- David S. Lewis, Jr.
  General Dynamics
- P. Takis Veloitis
  General Dynamics
- Lester Crown
  General Dynamics
- James Bridges
  Stromberg-Carlson
  (General Dynamics)

There may be others who we would want to add to the list. In any case, when you and Mr. Fiske agree that the risk of my calling is commensurate with the timing of the opportunity as you both perceive it, I will proceed promptly.

I will plan to call you on Thursday after you receive this to determine whether we need to discuss the agenda for the Friday morning meeting.

Warm personal regards,

R. Blair Murphy
Vice President
Managing Director - Stamford Office

RBM:mm
Attachment

Attachment 4 - Listing of materials prepared or presented to Mr. Fiske concerning the commercialization of the civilian satellite systems

1. Copies of the following materials were sent to Mr. Fiske on or about July 27, 1982: Commercialization of Civil Remote Sensing: Need for Prompt Policy Commitment, dated July 14, 1982; Commercialization of Civil Remote Sensing Response to NOAA Issues Paper, dated July 14, 1982; Earthstar Document, including Earthstar Update of March 15, 1982 and Earthstar Paper of December 14, 1981, including Annexes.

2. Draft of civil remote sensing satellite policy statement of August 27, 1982.

3. Comsat response, dated October 22, 1982 to Commerce Business Daily announcement, 2 volumes.

4. Draft of note on Presidential Memorandum of December 8, 1982 (could have been sent to either Fiske or Bayer).

Attachment 4-2

CIVIL REMOTE SENSING SATELLITE POLICY STATEMENT

It is the policy of this Administration to seek commercialization of Governmental activities which are not uniquely Governmental in nature since private enterprise is the primary source of our national economic strength.

The United States Government currently operates civil satellite systems to collect and disseminate remotely sensed weather and land satellite data. This data is used by numerous departments and agencies to perform Government services and is used by the private sector to extract information valuable in that sector. Civil satellite remote sensing is an activity which has a potential for substantially greater commercialization. Private entities have expressed interest in providing the remotely sensed satellite data that is needed by the Government and non-Government users on a commercial basis. The Land Remote Sensing Advisory Committee is currently soliciting other expressions of interest from the private sector for ownership and/or operation.

It is the policy of this Administration to seek the prompt commercialization of civil weather and land satellite remote sensing and to reflect that decision in the FY1984 budget documents assuming that the responses to the Land Remote Sensing Advisory Committee confirm our present information that commercialization would be economical and in the public interest. Interested commercial firms therefore should submit their proposals to the Land Remote Sensing Advisory Committee.

20-901 O - 84 - 99

COMMUNICATIONS SATELLITE CORPORATION

A. P. STATHAM
Vice President
Corporate Affairs

May 11, 1983

The Honorable James H. Scheuer
Chairman, Subcommittee on Natural Resources,
Agriculture Research and Environment
Committee on Science and Technology
U.S. House of Representatives
Suite 2321 Rayburn House Office Building
Washington, D.C. 20515

Dear Congressman Scheuer:

Several days ago Mr. Palmer of your staff requested certain information concerning Attachment 4-2 to my letter of May 2, 1983. I am please to provide the following information in response to Mr. Palmer's request.

Attachment 4-2 was one of several versions of a draft statement of policy that COMSAT wanted the Administration to consider for adoption. One version of the statement, which was included in the March 15, 1982 Earthstar update, was distributed to various government officials. As indicated in my May 2, 1983 response to you, a copy of the Earthstar update (Attachment 4-1) was sent to Mr. Fiske on or about July 27, 1982. A subsequent version of the policy statement (Attachment 4-2) was prepared on or before August 27, 1982 for transmittal to Mr. Fiske and was sent to his office by messenger service on August 27, 1982. We have been unable to determine whether Attachment 4-2 was sent at COMSAT's initiative or at the request of someone else.

Sincerely,

a. P. Statham

A. P. Statham

APS/jbr

950 L'ENFANT PLAZA, SW • WASHINGTON, D.C. 20024 • TELEPHONE (202) 863-6448

ATTACHMENT AA

DON FUQUA (Fla.) Chairman

ROBERT A. ROE, N.J.
GEORGE E. BROWN, JR., CALIF.
JAMES H. SCHEUER, N.Y.
RICHARD L. OTTINGER, N.Y.
TOM HARKIN, IOWA
MARILYN LLOYD, TENN.
DOUG WALGREN, PA.
DAN GLICKMAN, KANS.
ALBERT GORE, JR., TENN.
ROBERT A. YOUNG, MO.
HAROLD L. VOLKMER, MO.
BILL NELSON, FLA.
STANLEY N. LUNDINE, N.Y.
RALPH M. HALL, TEX.
DAVE MC CURDY, OKLA.
MERVYN M. DYMALLY, CALIF.
PAUL SIMON, ILL.
NORMAN Y. MINETA, CALIF.
RICHARD J. DURBIN, ILL.
MICHAEL A. ANDREWS, TEX.
BUDDY MAC KAY, FLA.
TIM VALENTINE, N.C.
HARRY M. REID, NEV.
ROBERT G. TORRICELLI, N.J.
FREDERICK C. BOUCHER, VA.

LARRY WINN, JR., KANS.
MANUEL LUJAN, JR., N. MEX.
ROBERT S. WALKER, PA.
WILLIAM CARNEY, N.Y.
F. JAMES SENSENBRENNER, JR., WIS.
JUDD GREGG, N.H.
RAYMOND J. MC GRATH, N.Y.
JOE BARTON, N. MEX.
CLAUDINE SCHNEIDER, R.I.
BILL LOWERY, CALIF.
ROD CHANDLER, WASH.
HERBERT H. BATEMAN, VA.
SHERWOOD L. BOEHLERT, N.Y.
ALFRED A. MC CANDLESS, CALIF.
TOM LEWIS, FLA.

J. H. POORE
Executive Director
ROBERT C. KETCHAM
General Counsel
DAVID S. JEFFERY
Minority Staff Director

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUITE 2321 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, D.C. 20515
(202) 225-6371

May 23, 1983

Honorable William French Smith
Attorney General
Department of Justice
Washington, D.C. 20530

Dear Mr. Attorney General:

It is our understanding that the Public Integrity Section of the Justice Department is currently conducting an investigation of former Deputy Secretary of Commerce Guy W. Fiske involving possible violation of the criminal conflict-of-interest statutes.

Our Subcommittee has also been investigating possible conflicts involved in Mr. Fiske's pursuit of high-level employment with the Communications Satellite Corporation while he was also the primary official responsible for supervising the Commerce Department's internal activities that resulted in development of a proposal to sell certain government-owned satellite systems. This policy was originally proposed and strongly favored by COMSAT.

There are a number of events I wish to bring to your attention which I believe carry a strong presumption of Mr. Fiske's active and knowing involvement in activities which constitute a violation of section 208 of Title 18. This information also appears to contradict public statements Mr. Fiske has made, the testimony he submitted to our Subcommittee and statements he apparently made to both the Secretary of Commerce and the Commerce Department's General Counsel.

Our Subcommittee staff has reviewed hand-written notes of telephone conversations and meetings kept by Mr. Blair Murphy, Vice President of Spencer Stuart and Associates, a New York executive recruiting firm. The notes cover a series of conversations and meetings Mr. Murphy held with Mr. Fiske and Dr. Joseph V. Charyk, then President and now Chairman of the Board of Directors of the COMSAT Corporation. The notes cover a period of twelve months between March, 1982 and March, 1983 during which Spencer Stuart and Associates was under contract to assist Dr. Charyk in locating a candidate for Executive Vice President and potential successor as President of COMSAT.

Mr. Fiske has maintained that his discussions with COMSAT were "preliminary in nature" and never reached the point of discussing a specific position or salary. Mr. Fiske has also maintained that no specific discussions regarding employment took place once he was formally serving in the Commerce Department and responsible for supervising the commercialization issue in which COMSAT was interested, other than what he characterizes as a courtesy lunch with Dr. Charyk on November 5, 1982.

Contrary to Mr. Fiske's assertions, Mr. Murphy's notes show that Fiske was actively and aggressively pursuing employment with COMSAT continually from March, 1982 until as recently as March, 1983. Although we have yet to develop specific evidence of direct discussions between Mr. Fiske and Dr. Charyk on the commercialization issue, there is strong circumstantial evidence that the commercialization issue was discussed on numerous occasions in a triangular fashion - that is, the principal parties, Mr. Fiske and Dr. Charyk, referred to the issue in conversations with Mr. Murphy - conversations principally concerned with Mr. Fiske's potential employment with COMSAT.

It is my strong feeling that any Justice Department investigation of Mr. Fiske's conduct will be assisted invaluably by the Department securing Mr. Murphy's handwritten notes. Among the more significant entires are:

- March 25, 1982, Murphy-Charyk telephone conversation discussing a "White House situation that has to be handled carefully" and a "Pen James problem" and that "Malcolm Baldrige is very close to [then COMSAT Chairman of the Board John D.] Harper".

- March 28, 1982, Murphy-Fiske telephone conversation in which Fiske tells Murphy he is definitely going to the Commerce Department but still "trying to get out...time is running out...I'm waiting to hear from you". Fiske says he "needs to know more about [COMSAT'S] business" and that Fiske "wants to interview key staff".

- March [29, 30 or 31], 1982, Murphy-Fiske telephone conversation in which Fiske amplifies a theme that his commitment to going to Commerce will be short-term, measured in "months". Fiske says "Meese twisted my arm...don't want to embarrass [Administration's] campaign to recruit candidates from business". Fiske advises Murphy to "keep it straight with Joe Charyk" and returns to the short-range commitment theme: "not if, but when".

- April 7, 1982, telephone conversation in which Dr. Charyk tells Murphy "timing not crucial....optimistic this will work out". In a notation, Murphy indicates "it's an open book on time on both sides".

- June 30, 1982, Murphy-Fiske telephone conversation, discussing various COMSAT Board members, including Justin Dart and Charles Pilliod, who is also Chairman of the Board and Chief Executive Officer of Goodyear Tire and Rubber. Fiske talks of "Admiral Garrick, former assistant to Meese...heads [West Coast] p.r. firm". Fiske tells Murphy he wants COMSAT'S "thoughts on responsibilities, contract and compensation levels". Notes indicate that Fiske could be available "October 1st at the earliest" and wants to be called if anything develops.

- September 17, 1982, Murphy-Fiske telephone conversation discussing "Landsat...putting out bids...not a complicating situation...put in public sector". Fiske says he is very busy at Commerce, but continues to seek the COMSAT job, stating "I am interested". Murphy quotes Fiske: "want presidency, not exec. v.p." and "What do they want me to do initially?-satellite business?...I am aware-conflict".

- September 21, 1982, Murphy-Charyk telephone conversation in which Charyk tells Murphy "there's no urgency" and discusses internal moves at COMSAT regarding a competing 'inside' candidate. Charyk says he wants "strict confidentiality on Fiske - don't upset reg[ular] org[anization]".

- December 28, 1982, notation on Murphy contact log says Fiske has "seen Joe C. on business - Landsat going public...COMSAT is logical one". This particular log sheet also contains notations of several other conversations held during September, October and November regarding internal developments at COMSAT.

- January 20, 1983, Murphy-Fiske telephone conversation - Murphy quotes Fiske: "I want the COMSAT job...want to plan reentering private sector".

- February 25, 1983, Murphy-Fiske telephone conversation in which Fiske asks if Murphy "has heard anything?" Murphy discusses Charyk's problems at COMSAT: "stock is dropping...he's getting heat".

- March 7, 1983, Murphy-Charyk telephone conversation. Murphy's notes indicate Dr. Charyk is "concerned about Fiske's activities in recent months... regarding privatization of government systems...he has taken an aggressive position". Murphy's notes add "Directors -- would that be a problem?" and "Tell Guy F[iske] -- we will know what direction we will go regarding in/out. If out, then will decide on Guy as a candidate".

- o March 21, 1983, Murphy-Charyk telephone conversation. Murphy notes "decision to go inside, sign-off on Guy Fiske. Board more comfortable with inside route".

On March 23, 1983, my Subcommittee sent a letter to Commerce Secretary Baldrige inviting him to testify at an April 14 joint hearing before two Science and Technology Subcommittees regarding the satellite commercialization proposal. Subcommittee staff had been at the Commerce Department earlier examining files relating to this matter. On March 25, Mr. Fiske went to the Secretary and informed him for the first time of his employment discussions with COMSAT, characterizing them as preliminary and in the past.

At best, Mr. Fiske has been exceedingly disingenuous in statements regarding his activities in pursuing employment with COMSAT. Mr. Murphy's notes, in conjunction with other documents in the possession of our Subcommittee, would seem to indicate more than the mere appearance of conflict-of-interest. Mr. Fiske has also maintained that he had little or no policy role in supervising the reversal of government policy regarding the proposed sale of land-sensing and weather satellites. Our Subcommittee intends to continue its examination of this question as part of its overall review of the merits of the transfer proposal. A preliminary review by staff does not appear to support Mr. Fiske's characterization of his impact on this proposal as being that of the "limited..expediter" he has described.

The information discussed above raises some extremely serious questions with respect to the activities of Mr. Fiske and warrants a complete investigation. I am confident you will give this matter the immediate attention it deserves.

Sincerely,

JAMES H. SCHEUER
Chairman
Subcommittee on Natural Resources,
Agriculture Research and Environment

JS/Kgb

cc: Malcolm Baldrige

COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, D.C. 20515

May 23, 1983

MEMORANDUM

TO: Members, Subcommittee on Natural Resources, Agriculture Research and Environment

FROM: James H. Scheuer, Chairman

SUBJ: Commercialization of Civil Remote Sensing Systems

Background

As you are aware, the Subcommittee has been conducting an investigation of the circumstances surrounding the proposed commercialization of civilian remote-sensing systems. On April 14, 1983, Secretary of Commerce Baldrige presented his Department's position on satellite transfer in a hearing before our Subcommittee and Mr. Volkmer's Subcommittee on Space Science and Applications. In response to questioning, Mr. Baldrige acknowledged that Deputy Secretary of Commerce Guy Fiske had been recused from further participation in the issue of commercialization. The Secretary stated that the recusal came about after Fiske had advised Baldrige that he (Fiske) had had several employment interviews with COMSAT over the previous 14 months.

The Recusal Decision

On April 27, 1983, I forwarded additional requests for information on Mr. Fiske's involvement with COMSAT to Secretary Baldrige, to Mr. Fiske's attorneys, and to COMSAT. From the responses to these probes, we learned that Fiske first informed Baldrige of his employment discussions with COMSAT on Friday, March 25, 1983. Later that same day, Fiske also informed Commerce Department's Deputy General Counsel, Irving P. Margulies of the employment interviews with COMSAT.

On Monday, March 28, Margulies recommended to Baldrige that the Secretary, rather than Fiske, should testify at the scheduled April 14, 1983 hearing before our Subcommittee -- a recommendation which was ultimately adopted. Baldrige deferred further action on Fiske until the April 5 return from the Far East of the Department's chief ethics officer, General Counsel Sherman Unger.

Baldrige, Unger, and Margulies met on April 5, when the decision was reached that Fiske and all those in his immediate office should recuse themselves from any further work on the commercialization issue. At the April 5 meeting, Baldrige also asked Unger to confirm with a written opinion Unger's view of the appropriateness of the recusal in light of the facts which Fiske had presented. Fiske formally recused himself and his staff on April 7, 1983. Unger's April 13, 1983 memorandum to Secretary Baldrige concluded that:

> "Mr. Fiske's discussion of employment with a company that expressed a high degree of interest in the purchase of NOAA's land and weather satellite systems while he had managerial responsibility for Departmental involvement in actions which could lead to a recommendation to the President for sale or transfer of that system violated [Section 0.735-10a of the Department's Standards of Conduct]. By his actions he created the appearance of (a) using public office for private gain; (b) giving preferential treatment to the corporation; and (c) losing complete independence of impartiality.

Unger further concluded that Fiske's recusal was an "appropriate response to these facts" and that "actual conflict of interest does not appear to exist in this case". This latter conclusion was based on Unger's preliminary finding that:

> "There was no particular matter Mr. Fiske was responsible for which could affect the financial interest of LANDSAT [sic] during the time of the employment conversations. Nor do we understand that the conversations between Mr. Fiske and COMSAT reached the point where a job was promised, or the terms of a particular job negotiated".

It should be noted that the General Counsel's conclusions that no conflict had actually occurred was apparently arrived at without the benefit of his having personally interviewed either Fiske or any representative of COMSAT.

Department of Justice Investigation

Following the April 14 appearance by the Secretary before the Subcommittees, probably on or about April 18, the Inspector General of the Department of Commerce referred the Fiske matter to the Department of Justice, and an active conflict-of-interest investigation has been underway in the Public Integrity section of the Justice Department since that time. Apparently the Inspector General learned of the Fiske/COMSAT matter from, and based his referral to Justice on, newspaper reports of the April 14 hearing, rather than on any direct communication between the Inspector General and the General Counsel.

Fiske's Testimony

In testimony submitted to the Subcommittee on May 3, 1983, Mr. Fiske denied any wrongdoing in connection with the proposed satellite transfer to the private sector. According to Mr. Fiske, the meetings and calls with COMSAT representatives, "never reached the point of actual negotiations....[and] at no time were any issues relating to [the transfer] discussed in the employment context". Fiske testimony at p. 4. Again in his prepared testimony, Mr. Fiske stated that, "there were no discussions whatever on the specific executive position, the nature of his duties, salary, benefits or other terms of employment...our talks can only be described as preliminary, exploratory and ultimately unproductive". At no time, according to Fiske, did he and Dr. Joseph Charyk discuss commercialization of Landsat or Metsats.

Fiske stated that his contact with COMSAT began in March 1982, when he was Under Secretary of the Department of Energy. He was contacted by Blair Murphy, an executive recruiter with Spencer Stuart and Associates, who arranged Fiske's first meeting with Dr. Charyk on March 17, 1982. A second meeting between Fiske and Charyk was held on March 23, 1982. Following the second meeting, Fiske was offered the position of Deputy Secretary of Commerce and on May 5, 1982 -- according to his testimony -- he "told Charyk personally that my name would definitely be submitted to the Senate and that I should not be considered a current candidate for any executive position at COMSAT". Fiske testimony at p. 7.

Fiske stated that he spoke to the executive recruiter again on September 17, 1982. He advised the recruiter that he was "not considering leaving government in the near future", but agreed after being "urged" by Mr. Murphy, "at least to have lunch with Dr. Charyk again after the election...". Mr. Fiske acknowledges that this luncheon "was a mistake". At the luncheon on November 5, 1982, "Dr. Charyk concluded, in substance, that if I had an interest in COMSAT when I left the government, I should contact them at that time...". From November 1982, until the end of March, 1983, Fiske stated that he talked to the executive recruiter Blair Murphy on three or four occasions:

> "It may well be that Mr. Murphy interpreted my comments as an expression of continuing interest in a position at COMSAT, but I did not intend them so. In fact, my wife and I had earlier decided that COMSAT was not the right situation for us. Rather, I viewed Mr. Murphy as a talented recuriter who still had an interest in brokering the COMSAT position, while my interest was more in maintaining long-range contact with a highly successful executive placement firm which might be of assistance to me when I ultimately left the government."

Conclusions

In sum, Mr. Fiske denied that there had been any impropriety in his dealings with COMSAT, either on the matter of possible employment or on the satellite sale proposal. His statement consistently attempts to leave the impression that he was not actively pursuing any specific position and that after May 5, 1982, his contacts with Murphy and Charyk were casual and carefully insulated against any connection with the commercialization issue.

Evidence recently reviewed and developed by Subcommittee staff, however, shows a different picture of Mr. Fiske's activities and behavior. The evidence shows that Mr. Fiske was actively and aggressively purusing employment with COMSAT continually from March, 1982 until as recently as March, 1983. The evidence also clearly indicates that Mr. Fiske did not inform Secretary Baldrige of any of his dealings with COMSAT until:

- o after he had been eliminated from consideration by COMSAT;
- o after the Subcommittee had asked to review documents at the Commerce Department; and

- o after the Subcommittee began asking questions relating to Mr. Fiske's role in the Department's review of the commercialization issue.

The evidence referred to above which indicates Fiske's recent and active pursual of employment with COMSAT is summarized in the attached letter which I have sent to Attorney General Smith.

The Subcommittee had planned to call Mr. Fiske as a witness, but in light of his recent resignation and in light of an active conflict-of-interest investigation by the Justice Department, we have cancelled Fiske's appearance. However, we are planning, in conjunction with the Subcommittee on Space Science and Applications, a series of hearings on the merits of both the Administration's proposal and other proposals for the transfer of civil satellite systems. You will receive a memorandum in the next few days outlining the purpose of this series of hearings, which is scheduled to begin on June 21.

JS/Pgb

Attachment

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